



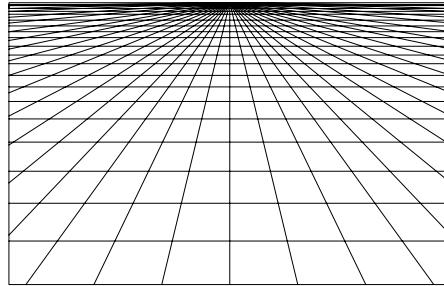
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***Technology Parks as Innovation Policy-  
a Study of the Technology Park of the Basque Country***

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## Synopsis

This thesis aims to explore how technology parks may function as innovation policy. Ever since the mid 1980s technology parks have been widely applied as policy instruments across Europe, and there is nothing indicating that this policy is losing its momentum. Although there have been many studies inquiring into the alleged effects of these parks, there is as far as I know, none which explicitly sets out to investigate these parks as innovation policy. In order to do this, I first examine the potential role of these parks as innovation policy in two generic classes of economic theories, respectively the neoclassical and evolutionary. I conclude that indeed according to these economic theories, the parks have potential as innovation policy, though they emphasise different areas. However, in order to further specify and explore the role of technology parks as innovation policy, I also identify four different approaches to innovation and relate these to technology parks. The four perspectives discussed are respectively; entrepreneurial studies, sector approaches, regional and national system approaches and management approaches. I also relate them to neoclassical and evolutionary economic theories, in order to shed some light on their theoretical foundation and rationale for innovation policy. A major conclusion is that although the four approaches differ in their relative emphasis on various actors and aspects in the innovation process, they overlap in their view on innovation as a complex social process involving many actors combining the use of both internal and external knowledge. It follows that an important function for technology parks in relation to innovation policy is to function as network builders for the on-park organisations. A key point however is that the parks need to differentiate and adjust their network building to the particular on-park firms. On the basis of the four approaches, five propositions about the technology parks as innovation policy are lined-out and discussed against the empirical data from the Technology Park of the Basque Country. The empirical data is based on 6 interviews with on-park organisations, an interview with the innovation manager of the park and a survey. It is argued that the evidence from the Technology Park of the Basque Country suggests that the park does not really function as innovation policy the way prescribed by the four innovation approaches lined out, and that maybe this particular park is better understood as regional development policy rather than as innovation policy *pr se*.

Keywords: Technology parks, innovation theory and innovation policy.

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Attending the graduate exhibition to a friend of mine at Oslo School of Architecture, the headmaster said the following: “The project is less”. In many ways, this captures how I feel about this thesis; although it certainly is the single most important thing I have ever written, it is only a little part of a long academic degree. I therefore would like to hope that it reflects some of the things I have learned at the university through the years. In many ways it appears as though the circle has been finalised, and I am truly grateful that this multi-disciplinary degree has given me the chance to actively draw on my background in economics, history and political science.

Tirill Aslesen, Oslo, January 2006.

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# 1 Introductory Chapter

## 1.1 Introduction

Innovation, here understood as a new or improved product, process or service that is introduced to the market with commercial success (Tidd et al. 1997), plays in many ways a vital role in the economy. It is widely acknowledged that innovation is an important factor behind economic growth, e.g. through technological change and increased productivity, and therefore also in the continuous rise in living standards in the so-called developed countries. Although it may be noted that the exact relation between innovation and economic growth varies over time and between innovations, it is nevertheless considered a key relationship in the economy (e.g. Verspagen 2005). At a less aggregated level, it is frequently pointed out that competition and short product cycles make innovations crucial for the long-term survival of firms. Moreover, research shows that competitive advantage at firm level increasingly derives from innovations (e.g. Tidd et al. 1997).

It is not surprising then that innovation is considered vital to national and regional competitiveness as well. Moreover, differences in growth rates between nations and regions have been attributed to different abilities to make use of new innovations as well as the quality of the innovation processes taking place in the respective nations and regions (e.g. Fagerberg 2005 and Isaksen 1997). The acknowledgement of this has of course also spurred increased interest in innovation policy, here defined as public policy aimed at influencing the innovation process, both by academics and politicians. It can be remarked however, that innovation policy is not a new phenomena, and that the meaning of this policy varies over time and across countries (e.g. Lundvall and Borrás 2005). Broadly speaking, one can identify two different rationales behind innovation policy today. The more traditional approach focuses mostly on frameworks conditions and especially considers under-provision of research and development, hereafter referred to as R&D, as the main aim of innovation policy. While the other rationale, takes a broader view, and focuses more on the underlying conditions for innovations in

various sectors and therefore on how most policy fields can influence the learning capabilities of firms in these respective sectors. This, together with changes in the economy over the last decades such as increased international competition and the emergence of new technologies such as ICTs, has led to debate over the working of innovation policy (e.g. Smith 1994).

However, parallel to this debate over the exact formulation of innovation policy, there has also been a large increase in the number of empirical studies on innovations (e.g. Fagerberg 2005). It follows that this renewed academic interest opens up for a better understanding of the innovation process, and equally important in this respect, possibilities for further refinements of the innovation policy. In line with parts the so-called “Science and Technology Studies”, a basic view in many of the newer empirical studies of innovations is that innovation is a complex phenomena embedded within a social, political and cultural setting. As many of these innovation studies also draw on different disciplines such as economics, sociology, geography and history, they fit well with the multidisciplinary approach of ESST. The increased knowledge about the innovation process therefore forms the starting point of my thesis. More precisely, I set out to inquire into how technology parks may function as innovation policy.

## ***1.2 The Research Question***

There are many reasons why it is interesting to look closer into how technology parks can function as innovation policy. Firstly, ever since the mid 1980s technology parks have been widely applied as policy instruments across Europe both at national and regional level, and there is nothing indicating that the policy is losing its momentum at present time. Accordingly, large amounts of money are invested into these types of establishments and public authorities are often the main contributors. Secondly, despite their ever-growing number, the theoretical rationale behind technology parks appears far from clear (e.g. Halvorsen 2001). As a consequence these parks are seen in relation to very different goals, ranging from a strengthening of the university and industry

technology transfer and incubation of so-called high-technology firms, to those concerning national and regional development at a more general level. Thirdly, while there are many studies inquiring into the alleged effects of these parks, as far as I know, few of these studies explicitly investigate technology parks as innovation policy. Fourth, because many of the studies on the technology parks find that these parks do not have the expected positive effect (e.g. Ferguson 1999, Halvorsen 2001, Lovgren 2003 and Monch et al. 1988), this too forms a good reason to inquire in more detail on how these parks may be viewed in various economic theories and approaches to innovation. Accordingly, the research question that forms the basis of this thesis is the following:

*How may technology parks function as innovation policy?*

*This is further specified into the following question: How can these parks help the on-park organisations in the innovation process?*

Because there are implications from previous studies on technology parks that these parks do not really function as innovation policy, and because I did not want to merely write a theoretical thesis, I also gathered data from a technology park in the Basque Autonomous Community in Spain; The Technology Park of the Basque Country. Notably, the park has changed name to the Technology Park of Bizkaia since I collected the data. However, because I only discuss the empirical findings from the time it was called the Technology Park of the Basque Country, I chose to use this name throughout the thesis. Therefore the Technology Park of the Basque Country is used as a case in this thesis. The aim is to discuss the case against the framework derived from the theoretical discussion, in order to see whether this particular park functions as innovation policy.

Although the focus of this thesis is on technology parks as innovation policy, the parks may of course perform other policy functions and be looked at from other perspectives than those brought in here. For instance, the parks may be important in attracting large international companies and hence in this way contribute to regional and national economic growth. Moreover, several studies suggest that large international companies



mainly populate these parks and that they have little connection to its immediate local surroundings (e.g. Massey et al. 1992). On the basis of this it has been argued that these parks can be described as enclaves rather than as integrated parts of a regional economy. Notably, research has also shown that very often not a lot of R&D takes place in these parks (e.g. *ibid*). It has therefore been suggested that the reasons for locating in these parks are many and diverse, though image is often seen as the most important added location value (e.g. Lovgren 2003). In fact, this is one of the major conclusions of the thesis and will be further discussed in the concluding chapter.

### ***1.3 What Exactly Is a Technology Park?***

In a study of technology parks, it seems appropriate to establish what exactly is meant by the term, or at least try to clarify how the term is understood. However, deciding on a theoretical definition of technology parks is not easy. Firstly, there seem to be a rather confusing array of related concepts, such as science parks, research parks, business parks and innovations centres to mention some, and the differences between these related concepts are often blurred (e.g. Grayson 1993, Halvorsen and Lacave 1998, Massey et al. 1992). And secondly, there exist no agreed upon definition of what a technology park actually is (*ibid*). Although technology parks are often referred to as one group, they differ both in stated goals and approach taken by technology park managers, depending for example on the urban setting or the specific regional industrial texture. Therefore, despite a common name, the different approaches taken yield a heterogeneous group of parks. An additional problem is the time perspective. It is well known that technology parks change during their time of existence, how to include such a dynamic aspect in the understanding of the park is obviously also a challenge.

Despite the variations over the term technology parks and related concept lined out above, the approach taken here is to focus on their main characteristics. Rather than drawing out the exact criteria that constitute a technology park, it is suggested that it is more convenient with a generic understanding of the term. Consequently, I chose not to distinguish between the terms, science, technology and research parks. The purpose of

such an approach is dual. On one hand it allows me to see the Technology Park of the Basque Country in relation to the related concepts such as science and research parks. And on the other hand, a generic definition makes room for changes both in relation to the aims and the functioning of the park. Hopefully, this also impedes any doubts and discussion about whether the case really can be labelled a technology park, or whether it falls into the category of some of the other related concepts

The International Association of Science Parks, IASP, provides a definition of science parks that emphasises the importance of the management of the park. Although their official definition is applied to science parks, it is explicitly stated that it may be replaced by the terms; technology parks, techno-poles and research parks. It should also be noted that the ISPA is a worldwide network of technology, science and research parks, in which the Technology Park of the Basque Country forms a member. The IASP International Board agreed upon the following definition in 2002 (w [www.iasp.ws](http://www.iasp.ws)):

“An organisation managed by specialised professionals. The main aim of the organisation is to increase the wealth of the community by promoting a culture of competition and innovation of the associated businesses and knowledge based institutions” To enable such a goal to be reached the following three functions are specified:

1. To stimulate and manage the flow of knowledge and technology among the associated university, R&D institutions, companies and markets.
2. To facilitate the creation and growth of innovation based companies through spin-offs and through incubation.
3. Create value added services together with high quality space and facilities.

Now obviously this definition can be criticised for being vague. Nevertheless, the definition catches what I consider to be the essence of technology parks, namely the added value of the location both in terms of services offered and in relation to transfer and the creation of knowledge. Moreover, the definitions should be considered a framework. All three tasks specified may be carried out in a number of ways, and so the definition opens up for different management approaches. Lastly, the framework should

be sufficiently wide to include some changes in the aims and functioning of these parks over time.

## ***1.4 The Structure of the Thesis***

In order to find out how technology parks may function as innovation policy, I have chosen to use four different approaches to innovation as a framework. However, as these approaches are not really comprehensive theories, I first discuss the rationale for innovation policy and how technology parks may be viewed in two influential theoretical traditions, respectively the neoclassical and the so called evolutionary in chapter two. In order to further specify the role of technology parks as innovation policy, I relate the technology parks to the following approaches in innovation studies; Entrepreneurial studies, sector approaches, national and regional innovation systems and managerial approaches. Hence, in chapter three I discuss how these four perspectives envisage the innovation process, their theoretical foundation and lastly how the technology parks may be viewed as innovation policy within the respective approaches. At the end of the chapter three I compare the approaches. Because I conclude that they to a large degree overlap, I suggest five propositions on how technology parks may function as innovation policy within these respective perspectives.

In chapter four some methodological considerations are made, before I in chapter five very briefly present the case.

Chapter six is a discussion of the empirical findings from the Technology Park of the Basque Country. The case is discussed against the five propositions lined out in chapter three. In the final chapter, the main findings are presented and some reflections over the role of technology parks are briefly discussed.

## **2 The Theoretical Bases for Innovation Policy**

### ***2.1 Introduction***

In this section I will briefly present the key characteristics of two generic classes of models for economic behaviour, respectively the neoclassical and the so-called evolutionary. The main intention is to discuss their different views on public policy, and in particular how technology parks may be understood in the two respective traditions. The main argument put forward is that because the two traditions are based on different assumptions about the behaviour of firms and the ideal state of the market, they will also differ in their view on appropriate public policy. Although the exact role of technology parks cannot be derived from the generic models, one can nevertheless make some tentative conclusions concerning their main envisaged tasks. I will argue that because the public intervention in a neoclassical perspective is focused on the market failures, the main role of technology parks within this framework is to contribute to correct these failures. The evolutionary economic theories however, are concerned with system failures, especially in relation to technological change. It follows that they see the parks in relations to a wide set of public and private institutions. Although the role of the parks are much more varied and illusive within these evolutionary economic models, one may conclude that their main role according to this line of argument, is to establish and enhance the contact between the various institutions which influence the innovation capabilities in the firms, i.e. to correct system failures.

### ***2.2 The Neoclassical Theories***

The neoclassical theories have a dominant position in micro-economic analysis, i.e. analysis of the markets for products, inputs and assets, across Europe (e.g. Varian 1996). More importantly however, and partly as a consequence of their prominence in micro-economic analysis, they have been the traditional approach to innovation policy

(e.g. Smith 1991 and Metkalf 1997). Due to their influential role in the debate over public intervention, I will spend some time outlining what I consider to be the key characteristics of these theories. The arguments for market failure will also be explained, before I relate its rationale for policy intervention to technology parks.

Although the neoclassical economic theories may be said to comprise a rather wide set of different models, it can be argued that they all use the so-called basic competitive model as a starting point (Stiglitz 1993: 28). This may be regarded as the simplest marked environment and is based around two main components:

1. Rational actors
2. Pure competition.

In the neoclassical economic theories a market with rational actors means that the firms are believed to operate in a way that will maximize their profits. If a firm departs from a situation of perfect foresight so that maximization becomes difficult, it is assumed that they then will behave rationally by making a risk assessment. Accordingly, the firms consider the possible outcomes, the probabilities of each of these outcomes and lastly they choose the alternative which outcome gives the highest expected values. The important implication of this understanding of rational actors is that all equal, firms are expected to make the same decisions (Lipsey and Carlaw 1998: 4). In other words they are perceived as a homogenous group of actors.

The second important ingredient in the basic competitive model is the state of pure competition. The notion refers to a state in which each firm assumes that the market price for any product it produces is set, and accordingly is independent of its own level of output (Varian 1996: 366). Given that both consumers and firms act rationally and that everyone has perfect information, a situation with perfect competition will, lead to a unique steady state of equilibrium, e.g. through market clearings. This perfect competitive equilibrium has very strong normative implications and hence is widely used as basis for policy formulations. The normative implications are based on the argument that the perfect competitive equilibrium describes a state in which an economy is perfectly efficient in the sense the welfare of the economy as a whole is

maximized (Stiglitz 1993: 29). The state is also referred to as Pareto efficient, commonly understood as a situation in which no change can make someone better off without at the same time making someone else worse off (Varian 1996:15).

According to this basic competitive model, the decisions the firms need to make mainly concern what to produce, how to produce it, how much and what price it will set on the product it produces (Stiglitz 1993). It follows from this that the model is mainly concerned with the allocation of scarce resources. In general innovations are therefore not explicitly modelled in the neoclassical theories. Moreover, innovations are usually only seen by their results, e.g. by an alteration in the production function itself, by a change in the nature of the input, through the Solow- residual of unexplained productivity increase or by larger measured input of physical and human capital (Lipsey and Carlaw 1998: 4). However, it can be argued that the theories do make some implicit assumptions about the nature of technology. It can for example be noted that for the above choice-set to be valid, it must be assumed that technologies are well known and can be accessed by all firms (Smith 1994:6).

While most economics adhering to the neoclassical way of thinking recognise that the economies are not perfectly described by the basic competitive model, they nevertheless use the perfect competitive equilibrium as a convenient benchmark for a well working economy (Stiglitz 1993:30). It follows from this that the basic competitive model is interpreted as the ideal way in which the market may function, and any deviation from the state of perfect competitive equilibrium is regarded as a market failure. The main implication of market failures is that there are better ways to allocate resources and that Pareto-improvement can be made. This means that there are ways to make people better off without making others worse off. Because market failures are more the rule than the exception in the real world, the actual performance of the economy according to this line of argument, is considered sub-optimal (Metcalf 1997:729). This however may be improved through policy interventions aimed at setting the conditions for Pareto-efficient market solutions to occur (e.g. Arrow 1962). The market failure argument therefore gives justification for government intervention in the neoclassical theories.

In relation to the creation and change of technology and innovations, three types of market failures are commonly believed to create inefficiencies in the production of new knowledge (e.g. Lipsey and Carlaw 1998: 11). Firstly, market failures allegedly take the form of externalities, defined as non-priced effects of an economic activity that are felt by parties not involved in the particular activity (ibid.). Although it can be noted that technological change is somewhat absent from the model, the neoclassical view on production as discussed above, implies that the firms are believed to know about and are able to access the relevant technologies. This public good aspect of technological knowledge, meaning it is difficult to impede others from using it, therefore suggests that knowledge cannot be effectively traded in the market. Property rights to knowledge are highly incomplete, and so competitors will be able to make use of at least part of this new invention, innovation and new knowledge that a firm produces through its R&D (e.g. Arrow 1962:170). Therefore, according to this market failure rationale, there is always a tendency for private firms to under-invest in R&D because the firms are unable to keep all the benefits from the investments to themselves

Secondly, externalities from innovations may also take on a wider form, and effect not only other firms, but the also the economy as a whole (Koch et al. 2003:5). It is well known that new technology and innovations have far reaching positive effects on the economy in a number of ways, and it suffices to mention a few here. Firstly, the economic benefit for the society as a whole can for example be related to the fact that innovative companies are often highly profitable companies and hence this again ensures taxes and employment (e.g. Tidd et al. 1997). Another way in which innovations effects the economy as a whole is through raising the productivity level in the institutions and other companies which make use of the new technology and innovations (Koch et al. 2003:5). Furthermore, new knowledge related to one innovation, often trigger further innovations in related areas. Therefore, because it is argued that innovations always render a certain extent of positive effects on the economy, the social returns from R&D are believed to far exceed those of the private firms. The deviation between private and social returns, i.e. what the private firms versus what the society as a whole gain, from innovations has therefore often been

regarded as type of market failure (ibid.). Again the conclusion is the same as in the section above; there is always a tendency for private firms to under-invest, from the society` point of view, in R&D and other activities that may lead to innovations.

Lastly, uncertainty related to estimating the technical and commercial returns from innovations is also widely believed to lead to market failures (e.g. Arrow 1962). According to this line of argument, this too results in the under-investment in R&D both from the side of the capital investors and from those making the strategic decisions within the firms. While one can compute the risks, innovations are unique events to which probabilities estimates are not well suited (Metcalf 1997:732). As consequence, there is a fundamental element of uncertainty related to investments in innovation activities. An additional problem is asymmetric information between the firms and potential supplier of capital (ibid.). Many potential capital suppliers do not have the sufficient technical knowledge needed to understand the potential of the R&D projects carried out by the firms. Consequently, they will often be reluctant to make such investments. This same type of information asymmetry can also be found between the firms R&D managers and the board of directors (ibid.). Again this is expected to lead to under-investment in R&D and innovation activities more in general.

The three market failures lined out above suggest that market mechanisms will not allocate the right amount of resources to innovation activities, mainly due to the public aspect and uncertainty related to technological knowledge and innovations. However, a critical comment can be made as to whether public policy actually can ensure the right amount of resources to R&D (Smith 1991: 260). Furthermore, it may also be noted that the framework does not specify how much R&D that should be carried out (Koch et al. 2003:4). Despite of these problems, the traditional public approach to innovation policy has been interventions aimed at the managing of the science base and the creation of financial incentives to industrial R&D (e.g. ibid).

Therefore, following a neoclassical line of reasoning for innovation policy, the technology parks should first and foremost be seen in relation to the alleged industrial



under-provision of research and development activities. It follows that the imminent question is how the technology parks can encourage the firms to carry out more research and development.

While there is no clear-cut answer to this question, it seems clear that such a policy may be pursued by the technology parks in several ways: First and foremost the parks may ease tenant firms' access to capital for R&D. The location in the park can for instance be tied with the qualification for public funds related to R&D, either in the form general support or the support for certain projects. Also, the parks may provide advice to firms about how to gain access to capital from private and public sources. One may assume that the technology parks managers are connected to a networks of representatives from banks, ventures capital and agencies set up to help the firms financially, e.g. incubators and public funds for industrial development. This implies that the firms will spend less time tracing down the sources themselves. Furthermore, they may indirectly be helped to access capital for R&D because the location in technology parks may increase the credibility of the firms (Halvorsen 2001 and Lovgren 2003). The technology park may also help to gain access to capital by helping to bridge the information gap between the firm and their investors. The management of the park may for instance give the firms advice on how to present the company for the potential investors and how to draw out business plans in order to achieve capital investments. Furthermore, within this theoretical frame one may envisage the technology park to encourage research and development indirectly by offering good rent deals in well-suited locations for such activities.

Also, the technology park may influence the knowledge base of the firms located there by offering them cheap courses that may increase the firms' ability to carry out research, as well as knowledge on how to protect or trade their R& D. The park management may also inform about joint R&D project with the university and other public knowledge institutions, which again can reduce the costs and risks related to innovation. In general the park may form a link between firms and the nearby university by offering information about possibilities for university expertise, student placements

and university research, and hence help the university communicate what it has to offer the firms.

To summarize: The focus within the neoclassical framework is on the parks' role in relation the encouragement of R&D, and the sharing of risk related to R&D with different actors. Moreover, the framework implies a perspective on technology parks mainly as a place for R&D.

### ***2.3 Evolutionary Economic Theories***

Evolutionary economic theories emerged out of a mounting critic of the neoclassical theories in the early 1980s. There was especially a strong dissatisfaction with lack of attention given to the dynamics of technological change (e.g. Nelson and Winter 1982). As a consequence a main concern in evolutionary economic theories is to explain how and why competing technologies develop (e.g. Smith 1991). This focus on the dynamics of technology obviously also make them relevant as basis for innovation policy formulations. While it should be noted that evolutionary economic theories have not yet achieved the same degree of articulation and recognition as the neoclassical theories, they have nevertheless become a powerful influence on policy formulations across Europe the last ten years, both as an addition and as an alternative to the neoclassical rationale for public intervention (Koch et al. 2003:4).

Although evolutionary economics draw on a wide range of theories and encompass different models, they all share the basic assumption that innovation is the most important factor behind economic growth (McKelvey 1994:18). Hence, the importance of technological change and innovation form the starting point of these theories, and they attempt to give an account of both short and long term economic development.

As already mentioned an important feature of evolutionary economic theories is their criticism of neoclassical economic models. Most notable perhaps is their critic of the neoclassical view on the economic behaviour of the firms. They abandon the neoclassical assumption about profit maximization firms under the condition of certainty or risk. Instead they perceive the firms as profit seeking under the conditions of incomplete information (e.g. Saviotti and Metcalfe 1991:9). This view on the firms has some important implications: Firstly, because the firms are believed to have incomplete information about most matters, including technology, the competence base of the firms will differ (Smith 1991:261). Secondly, in order to deal with the lack of complete information, the firms make decisions on the basis of routines. Because these routines have developed from the past experience of the firms, they are likely to change over time and vary between firms (Nelson and Winter 1982). Accordingly, the firms differ both in relation to competences and operating procedures. The incomplete information together with a unique set of decision-making routines within firms, suggest that they at the best the firms are believed optimise locally. It follows that there is no such state as unique welfare-maximizing equilibrium in the evolutionary economic tradition, i.e. a state where no one can be better off without someone else being worse off. In fact the framework makes it very difficult to settle on any normative description of what the economy should look like (Smith 1991:265).

Furthermore, another important difference between the two groups of theories is that the evolutionary theories explicitly model innovation. Moreover, technological change and innovations more generally, are laid out as two- stage process, one that creates variety and one stage where selection takes place, i.e. the diffusion of innovations (Koch et al. 2003:4). The firms are believed both to be creative and to be able to imitate, and so hence they are central both in relation to the creation of innovations and the diffusion process. The main initiative for firms to innovate is captured in the notion innovative competition. This idea states that while the firms compete both on price and characteristics of goods, the chief mean by which a firm can gain a competitive advantage is through innovation (Smith 1991:262). The competitive advantage derives from the fact that a new technology, or any other innovation for that matter, is not considered uniformly accessible to all firms in evolutionary theories (ibid.). Rather, the

theories argue that innovations are generated within the firms through the interaction of various actors as well as through combination different pieces of knowledge. It follows from this that it will take time for the other firms to imitate a new technology, and hence it gives the innovative company a competitive advantage at least for a certain time.

As laid out in the above section, innovation is seen as a constant interplay and mutual learning between different types of knowledge and actors. When innovating, the firms engage in search activities for new opportunities, and they do this on the basis of their existing knowledge base. The firms will also however, use external sources of knowledge when engaging in search activities in order to innovate. (Koch et al. 2003: 6). This means on the one hand that innovation is seen as learning process, which is cumulative and gradual. And on the other hand, the innovative capability of the firm is not only dependent on its internal processes, but also on how it interacts with external sources of knowledge.

The second stage in technological development is the selection process, i.e. the diffusion of the innovation. The market is the fundamental selection mechanism in evolutionary economic theories. As mentioned before, the selection takes place on the basis of price and different characteristics of the various products (Smith 1991: 261). Following the assumption of incomplete information, the firms do not know what price and attribute combinations that will succeed. They will however, through innovations try to influence future markets. The selection process generates patterns of new technologies, often referred to as trajectories. These trajectories develop through the following two mechanisms: The successful firm will continue to invest in the technology. And secondly, through learning and imitation other firms adapt towards the selected technology (McKelvey 1994:19).

Considering the emphasis on innovation as the single most important factor behind economic growth in evolutionary theories, it is hardly surprising that the evolutionary framework is compatible with parts of the neoclassical rationale for policy intervention. The evolutionary rationale for intervention does for example agree with the neoclassical argument stating that the social rate of returns from new knowledge and innovations are

much higher than companies' own profit from R&D (Koch et al. 2003). However, as discussed above, evolutionary theories reject the idea of a pareto-optimal welfare equilibrium as a normative basis for policy intervention. And furthermore, due their emphasis on change and uncertainty, it seems difficult to describe what an ideal economy within an evolutionary framework might look like (e.g. Smith 1991:265). In general, an evolutionary approach to public intervention therefore moves away a policy aimed at setting the environment conditions that will generate the desired welfare equilibrium, towards a broader approach that focuses more on the underlying production conditions for the development of innovations (Koch et al. 2003).

A central feature of innovation policy within an evolutionary framework is their emphasis on various forms of support for innovation activities. Generally speaking an evolutionary approach to policy will focus on a wide spectre of innovation activities including design, marketing, commercialisation, learning and networking (Metcalf 1997:735). This broad approach also includes policies aimed at a wide set of institutions that may influence the innovation process. In relations to firms, the innovation support according to the evolutionary rationale may be focused in three areas. Firstly, the support aimed at the internal management of the firms and especially processes related to innovation. Secondly, the support directed towards the firms' external sources of knowledge in order to improve the quality of these. And lastly, the links between the firm itself and external sources of knowledge may be targeted, both in order to establish new links and to improve the quality of the interaction already taking place (Koch et al. 2003:6). It follows from these different areas of focus that an important aim for policy within the evolutionary framework is to design and improve support-structure for innovative activities. However, it should be noted that because the competence bases of the firms differ, the policy support for firms should also differ within this framework.

The building and improving such a support structure is often referred to as systemic innovation policies (ibid). Obviously such a policy may be carried out in a number of ways. Ranging from policies aimed at changing the attitudes, e.g. willingness to invest in risky innovations projects, to the setting up of new knowledge producing institutions.

Furthermore, if the support system once established appears to be malfunctioning, this is also a rationale for policy intervention. This is often referred to as system failure. System failures may take many forms, and can range from poor interaction between the institutions, to laws and regulations that hamper the innovation process. An obvious problem is of course that there is no clear-cut answer as to when a system failure actually does occur or how to solve them. Nor is there any blueprint as to what a support system should look like. It is also worth noting that these anyway are assumed to be dynamic and constantly changing (Lundvall 1992).

From the discussion above it seems clear that technology parks within an evolutionary policy framework mainly will focus on how they may enhance the learning capabilities of the firms located on the parks. An immanent question then becomes how technology parks may help build and improve the support structure for the on-park organisations. Furthermore, this also raises the more overall question of how the technology parks themselves form a part of such a support structure for innovation.

Again an obvious problem is that the evolutionary economic theories give no detailed prescription on how this may be done; they merely suggest a perspective on how the parks may be viewed. Therefore, the park may function as support structure for the firms located there in a number of ways (e.g. Koch et al. 2003).

Firstly they may influence the innovation capabilities of on-park organisations by offering them various courses aimed at internal management of knowledge and functioning of the firms.

Secondly, an important task for a technology park within an evolutionary perspective is to ensure access to various external knowledge sources for the innovating on-park firms. This perspective emphasises the technology parks as networks builders. Again this may be pursued in various ways. The parks may for instance encourage contact and knowledge exchange between the organisations located in the park. The enhanced contact between the organisations may be seen both as a result of close physical

location as well as a more active role from the side of the management of the park. Furthermore, the park may also encourage contact and establish information about various off-park sources of knowledge and capital institutions, which are defined as part of the innovation support structure.

Thirdly, the emphasis on park as builders of networks, suggests that the park not only may help the firms to establish contact with various sources of knowledge and capital, but also should help to strengthen these contacts. Again this may be done in several ways, e.g. by offering facilities for interaction, by offering workshops and management courses etc.

To summarise, the evolutionary perspective sees the parks both as part of a larger innovate support structure, as well as a place for interactive learning between the organisations located there. It follows that parks are seen in a wider learning perspective than what is the case in a neoclassical framework. Hence, it is not mainly a place for R&D, but a place where interactive learning and knowledge exchange of all kinds takes place.

### **3 Innovation theories**

#### ***3.1 Introduction***

A general problem with both the neoclassical and evolutionary economic approach to innovation policy is that they do not spell out the exact role of technology parks in relation to these policies. On the contrary, as discussed in chapter two, the parks may perform a number of functions within the respective frameworks. This lack of specification on the exact role of technology parks in relation to innovation policy can be traced back to the fact that both the neoclassical and evolutionary economic theories are quite vague on how innovation actually happens in the real world. Although that they give a rationale for innovation policies based on some basic assumptions about the

firms and problems related to the knowledge creation process, none of the theories are very specific on how the innovation process proceeds and its determinants. Clearly, some implicit assumptions about the innovation process can be drawn from these theoretical frameworks. However, as pointed out above, they open up for quite a wide range of innovation policies. The purpose of this section is therefore to get a more detailed and perhaps a more realistic view on how these parks may be envisaged to assist the organisations located there in the innovation process.

I will approach the question by looking at some of the most influential innovation studies the last 20 years or so. Although it can be pointed out that “field” innovation studies were somewhat neglected for many years, the number of publications on the theme has exploded the last decades. Consequently, so has also the knowledge about the innovation process and its determinants (Fagerberg 2005: 3). Now obviously, this makes it difficult to get a proper overview of the scholarly work in the field. However, some broad perspectives on the innovation process appear to stand out, respectively: Literature on entrepreneurship, sector approaches, national and regional system approaches, and innovation management approaches (e.g. *ibid* and Sundbo 1995).

The four perspectives will be presented and related to technology parks in this section. Furthermore, because perspectives cannot be said to be comprehensive theories, I will also try to relate them to neoclassical and evolutionary economic theories in order to shed light on their theoretical foundation and rationale for innovation policy. It should be added that although the four streams represent different perspectives on innovation, there are nevertheless some clear links and overlapping between the four. Therefore, I will sum up the discussion by comparing the four perspectives, looking at both what they have in common and their differences. The main argument put forward in this chapter is that because all of the four approaches presented stress the interactive nature of the innovation process, one would expect the parks` main role in relation to innovation policy is to function as network-builders. Furthermore, as all of the streams also emphasise the variance between firms in the innovation process, the parks are therefore also expected to adjust their network building to the particular needs of the firms located there.



### ***3.2 Literature on Entrepreneurship and Technology Parks***

In studies on New Technology Based Firms, hereafter NTBFs, innovations play an important part in the launch of a new firm (e.g. Okey 1995 and Tidd et al.1997). Consequently, it can also be argued that the studies on the establishment of these firms give some important implications on the main determinants of innovations. Furthermore, because technology parks are often considered to function as seedbeds for these firms (e.g. Lovgren 2003, Monch et al.1988), I will inquire into some of the results found in the research done on NTBFs.

Although it can be remarked that there is some confusion over the exact definition of NTBFs, most definitions emphasise the following three dimensions: They are based on emerging technologies, they are the result of an entrepreneurial initiative and they have the competence which enables them to deal with the technology they are exploiting (Ferguson 1999:19). The research suggests that the establishment of these businesses can be related to three factors; the individual skills and character of the founder, technological and market characteristics (Tidd et al. 1997:340). It follows that that in line with the evolutionary theories, the technology base is regarded as fundamental for the innovation process and the launch of NTBFs. However, because these firms are new, they have not yet gained the experience to establish those search routines described in evolutionary economic theories. Consequently, it can be argued the key founders are much more central here than what one might expect from evolutionary economics (e.g. Nelson and Winter 1982). Moreover, it is not just the technical skills of the key founder which are central, but also the more general character of this person is considered a key point for the lunch of NTBFs (e.g. Tidd et al 1997).

The studies on the NTBFs have therefore inquired into the psychological profile of the founder of these firms. The findings suggest that the entrepreneurs of NTBFs typically have a master-level education in the field on which the firm is based and ten to 15 years of work experience. The decision to create a NTBF typically starts with a feeling of dissatisfaction with its current workplace, whether it is in private or public sector. As a consequence the founders tend to be highly motivated and demand a high level of

autonomy (Okey 1995). It can be argued that this rationale implies that the decision to launch a firm is founded on a utility and costs considerations from the side of the entrepreneur, where he weighs what he gains in independence and technical freedom, to the security and income of his current workplace. This type of utility considerations must be said to be much more in line with the neoclassical theories than evolutionary economic theories, where the first tend to emphasise these types of rational behaviour rather than routines. On the other hand, the importance of the technical skills of the entrepreneur in order for him to be able to and to even consider launching a NTBF in the first place, nevertheless fit well with evolutionary economic theories. As discussed earlier, these theories assume that technologies to a large degree are path dependent, and hence what a firm does tomorrow, or in this case an entrepreneur, is to a large degree is dependent on the their competences to day (e.g. McKelvey 1994).

Furthermore, although the entrepreneurs gain independence and technical freedom, they need to need to raise finance and functional expertise. Research implies that these last two points often prove to be the most difficult in the process of creating a successful new NTBF. For instance a typical problem with the business plans of NTBFs is the lack of attention given to marketing and competition analyses. Therefore, while the entrepreneurs of NTBFs tend to have strong technical skills, they typically lack the market and managements skills to succeed (Tidd et al. 1997:348). In addition to this, it has been suggested that NTBFs have more difficulties in securing external resources than other firms. Firstly, it is assumed that NTBFs have special needs for technical skills due to the both the newness and the particular technological content on which the firms are built. Secondly, because the firms are based on a new technology, which is not well understood by other in the environment, the NTBFs are assumed to have particular problems obtaining the legitimacy and credibility necessary to gain access to the needed resources (Ferguson 1999:20).

Based on the above findings, one may suggest several ways in which technology parks may be expected to support NTBFs firms, and therefore at the same time also support their innovation processes. Firstly, the emphasis on the entrepreneur as a key agent suggests that according to this rationale, much of the support will be targeted at these

people. Moreover, the parks are expected to enquire into the particular skills of these people, or lack of skills to be more correct. The findings further suggest that the key-founders particularly will need support by the parks to better understand the market, as well as on management more in general. It can be assumed that the technology parks may provide this in several ways; either through the arrangement of adapted courses or through assisting the NTBFs in making good business plans.

In order to ensure the NTBFs access to specialised technical skills, the parks are also expected to develop links with universities and other public knowledge producing institutions in the forefront of the relevant fields. Again this of course requires attention to the particular characteristics of the on-park NTBFs, e.g. which types of technologies they are based on, in order to keep in contact with the right knowledge institutions. The parks are also expected help access to relevant skills by arranging student internships, encouraging the exchange of staff or more in general by profiling the park as a good working environment.

Furthermore, the findings above suggest that the parks can be expected to provide an environment in which the NTBFs can link with likeminded. Contact with similar on-park NTBFs can be important both in order to secure recruitment and further development of technical knowledge and skills, through both informal and formal on-park collaboration. It also follows that these parks are expected to attract NTBFs with related knowledge bases, so that they are able to exchange personal and technical skills. Lastly, in order to give the firms located on the park the necessary credibility, they are also expected market the park and to be selective as to what sort of companies they accept into the park.

In sum it can be argued that the knowledge about the creation of NTBFs, even if these studies are not innovation studies *pr se*, suggest that technology parks may function as innovation policy by supporting the key founders of NTBFs with marketing and management skills, as well as to ensure extensive contact with universities and knowledge institutions. A key point however, is that the parks need to adjust this policy to the particular technologies and key people of the NTBFs.

### ***3.3 Sector Perspectives on Innovation and Technology Parks***

#### **3.3.1 General Sector Perspectives**

There exist a number of different innovation models that explicitly set out to describe the innovation process as such (e.g. Rothwell 1992). The various models take into account different variables and model the dynamics of the innovations process differently (e.g. Kline and Rosenberg 1986 and Smith 1994). Clearly, some of the variations reflect the evolvement of the innovation process through time. The way innovations occur today are obviously very different a hundred years ago, or even just a decade ago (e.g. Rothwell 1992). However, the variation in models also prompts discussion over which of them that is best suited to describe the innovation process. Furthermore, an important question in relation to this is obviously also what implications the variations in models have for technology parks as innovation policy.

A classic debate in the field of innovation studies has concerned the sources of innovation and the relative importance of these in determining the patterns of innovative activities. More specifically, there has been a continuing discourse on whether innovations develop from research or are the result of market needs (e.g. Pavitt 1984). To day however there seems to be a general agreement that both market and technology are important in the innovation process (e.g. Soete and Freeman 1987 and Tunzelmann and Acha 2005). Though, it can be added that their relative influence in the innovation process may vary between companies, and at a more aggregated level between industries and sectors (e.g. Malerba 2005). One can argue that such view, i.e. variety in the innovation process between firms and industries, corresponds with the evolutionary economic theories, which argue that search processes of the companies will be limited and influenced by their knowledge base and that this base will vary from one firm to the other (e.g. Nelson and Winter 1982).

In what has often been referred to as a groundbreaking study, Pavitt (1984) demonstrates that there exist different types of innovative activities across different

types of sectors. In line with evolutionary view on technological knowledge, his main argument is that technology is not generally applicable, but specific to firms, cumulative in its development and varies amongst sectors in sources and direction. The argument about the specific and cumulative nature of technological knowledge is based on what the firms report as their most important knowledge-input. On basis of data of 2000 significant innovations taken into use in the period 1945-1979, he develops a taxonomy based on the characters of developments and directions of flow of these innovations. He considers a key difference among sectors to be the sources of innovations and the appropriability mechanisms. On the basis of these findings he then suggests four types of sector patterns for innovative activities: supplier-dominated, the scale-intensive sector, specialised supplier and the science-based sector.

However, it can be argued that there is need for further refinements in sectors models based on newer data. Malerba (2005:385) suggests a sector approach to innovation based on the three following dimensions: Knowledge and technological domain, actors and networks and institutions. Much in line with Pavitt (1984), he argues that each sector have a rather specific knowledge base, technologies and inputs. And further, that the features and sources of the knowledge within a sector affect the innovation process (Malerba 2005: 385). Again this line of reasoning is very compatible with the evolutionary economic theories, which argue that each firm has a unique knowledge base and therefore also has a restricted search zone based on this knowledge base (e.g. Nelson and Winter 1982). Unlike Pavitt (1984), Malerba (2005) also explicitly states that relationships and networks will differ greatly according to sectors. Again, much in line with evolutionary theories, he argues that this is due to specific features of the knowledge base (Malerba 2005:392). However, it can also be argued that this line of sector models to a certain extent treats the firms within different sectors as a homogenous group of actors. If this is the case, well then the sector models too have elements from neoclassic theories. One can for instance argue that certain sectors, e.g. biotechnology, is plagued with a certain kind of market failure, and that one therefore should meet the sector as a whole with a specific type of policy based on this.

Nevertheless, both Pavitt (1984 and 2005) and Malerba (2005) explicitly conclude that there is not one innovation model, but several. Even if neither of them line out a typology of innovation models that further refines the typology lined out by Pavitt (1984), one can still draw some conclusions from their sector approach regarding technology parks as innovation policy.

Firstly, the technology parks are expected to have a deliberate let-in policy based on sectors. The sector approach implies that there may be technological synergies between and within sectors. According to this logic one would expect the technology parks to ensure that the companies located on the park speak the same technological language and/or have strong technological links e.g. through customer relations. Obviously, this line of reasoning is much in line with the presumed role of technology parks in relation to NTBFs lined out in section 3.2. There too it was emphasised that parks are expected to pay attention to the type of NTBFs they let in, in order to ensure communication and technological links between the on-park firms.

Secondly, the findings also suggest that the same policy will have very different effects on firms belonging to different sectors. Therefore, in order for technology parks to support the firms, one will assume that they adjust their role according to which sectors they wish to attract and are present.

### **3.3.2 Biotechnology Sector Perspective**

In the case of the Technology Park of the Basque Country, the park has defined biotechnology as a future industry and in particular wishes to attract more firms from this sector (e.g. interview with Angeles Ibrondo). Furthermore, because this sector in general is considered an important future industry not just for the Basque Autonomous Region, but also for Europe as a whole, I will spend some time inquiring into how technology parks may function as innovation policy in relation to this particular sector.

According to OECD biotechnology is the use of scientific and engineering principles based on microbiology, genetics, biochemistry, chemicals and biochemical engineering to transform material using biological agents such as micro-organisms (Nosella et al. 2005:842). Using Malerba's (2005) framework outlined above, I will briefly try to describe the knowledgebase, actors, networks and institutions in this particular sector. I will then use this as the bases for a discussion of the policy implications.

The search techniques and the knowledge base on which the sector is based today, developed from important scientific breakthroughs in biotechnology from the 1970s and onwards. Notably, public institutions such as universities often generated these advances. For instance, discoveries in the field of pharmacology, enzymology and cell-biology led to a much better understanding of the mechanisms on which existing drugs act, as well as of the biochemical and molecular roots of many diseases. This again transformed the firms' R&D search for new drugs. By using so-called "guided search" based on the new knowledge, the search process has become much more efficient and scientific (McKelvey et al. 2004). It follows that the development of the knowledge base in the biotechnology industry is closely linked to public research at universities, and hence in order to take advantage of new techniques and knowledge developed within this field the biotechnology, the firms must be able to access and understand this publicly generated knowledge.

From the 1980s small new biotechnology companies whose original aim when starting up was to use biotechnologies to produce products and services emerged. These firms are often referred to as new biotechnology firms or NBFs, became a new and important player in the industry in addition to the larger and more established pharmaceutical companies. Obviously, it can be noted that these small biotechnology firms fit well with the definition of NTBFs given in section 3.2, and so I will refer to them as NTBFs in the biotechnology sector. Especially in the early 1980s the establishments of these firms were strongly linked to the presence of leading scientist working in public institutions (Zucker et al. 1998). However, the universities still remain important as a training institution for the future employment of NTBFs in biotechnology sector. Compared to the other sectors, such computer sciences for instance where many skills can be

developed through the use of computers at home, these firms need people with skills developed through university training. Not surprisingly, studies of NTBFs in the biotechnology sector also show that almost all the founders have their background in either research institutions or universities (e.g. Pfirman 1999:654).

NTBFs in the biotechnology sector have often specialised in different biotechnologies, not necessarily in order to produce a finished product themselves, but often to provide services to companies involved in e.g. development and production of drugs (McKelvey et al. 2004:94). It follows that the NTBFs in the biotechnology sector not only need to establish strong links to universities and the scientific community in order to access knowledge and skilled workers, but also often collaborate with larger companies, e.g. pharmaceuticals. Moreover, it has been argued that the innovation process in the biotechnology sector most accurately can be described as an open process where different institutions specialise in the stage of innovation process in which they are the most efficient; universities and research centres in the first stage, the NTBFs in the second and the bigger and older firms in the last phase (ibid). Specialisation in the innovation process is not necessarily unique for the biotechnology sector; however the actors and links are never the less different. In other words the important links in the drug-development part of this sector is for instance between the following actors; the universities which offers courses in biotechnology, small specialised biotechnology firms, larger pharmaceutical firms, producers of equipment used by these three actors, the pharmacies and lead-users in relation to different end-products, public institutions influencing laws and regulations in the sector and of course private and public sources of capital.

Hence based on the foregoing discussion, one would firstly expect the technology parks to have thought through which type of biotechnology companies they wish to attract. If they in particular wish to attract the smaller and newer firms in the biotechnology sector, the NTBFs, one would expect the parks to offer suitable facilities for research, either in the sense of shared facilities or simply suitable location for such activities to take place. Furthermore, and in line with the argument put forward in section 3.2, one



would expect the parks to offer these small and new firms infrastructures, help to access finance and offer management support especially adjusted to the biotechnology sector. Special incubators facilities aimed at newly founded firms in the biotechnology sector should also be expected to exist in the technology parks. These incubators would in addition to the aforementioned services, be expected offer cheap rent and general services, such as a reception area etc.

If the parks on the other hand aim to attract larger and more established firms in the biotechnology sector, a somewhat different strategy should be expected to find. For instance one would expect the park to offer suitable facilities for a large firm in terms space and infrastructure, as well as flexibility from the side of the park in on how to design their space. Furthermore, because the innovation process for quite a few firms within this sector is described as a so called “open process”, one would expect the technology parks to want to attract biotechnology firms specialised in different stages of the innovation process and not just one type of firm.

However, the most important role of the technology parks in relation to the innovation process in biotechnology firms is as mediator of contact between the on-park firms and university and other research institutions. Again this is much in line with arguments about NTBFs put forward in section 3.2. All firms in the sector are dependent on access to university-educated employees. Furthermore, they need connections to relevant university departments both in order to acquire research results and to be updated on where the research is going in their particular area. One would therefore expect the technology park management to emphasise relations to the local university that offers courses in the biotechnology, e.g. by arranging regular meetings and to have overlap in the management between the university and the technology park. Furthermore, the parks may also wish to create a so-called open academic atmosphere. This could for instance be done by hosting conferences in the biotechnology area of interest for the on-park companies and by having parts of the university and other research institutions connected to biotechnology located on the park. Lastly, one would also expect to find meeting-rooms and laboratories aimed especially at contact between biotechnology companies.

In sum, one would therefore expect the technology parks have special incubators aimed at the NTBFs within the sector. And further that they to emphasise and profile the parks` affiliation with universities and research institutes working with biotechnology, in order to attract and host companies belonging to the biotechnology sector.

### ***3.4 National and Regional System Approaches and Technology Parks***

The system approaches to innovation emerged in the early 1990s and were quickly picked up both by academics in the field of innovation studies and by politicians (e.g. Edquist 1997). The approaches focus on various forms of learning related to the development, use and the diffusion of innovation (Lundvall 1992). A basic assumption is that learning is a social and interactive process (ibid). It follows that the innovation process also must take on these characters. Notably, the approaches take a very wide view on innovation and includes products, process and service innovation. Furthermore, it is also pointed out that most innovations are incremental, meaning that they embody only small changes (Edquist 1997).

The starting point of these approaches is therefore that firms do not innovate in isolation from their environment. The firms are embedded in a particular social and institutional setting, which will influence the innovation process. Interaction with customers, suppliers, competitors and various private and public organisations are important for the innovation process. Therefore, it is argued, a system approach to innovation is necessary in order to understand the process (Edquist 2005).

Lundvall (1988) was the first to use the term “national system of innovation” in relation to studies on user and producers interaction. He concluded that there were many reasons why such an interaction would gain both parties in the innovation process. Furthermore, he observed that these patterns of interactions were largely constricted to national borders, or at least much more common within than across nations. On the basis of this

observation he argued that the patterns of interaction are conditioned by national codes and culture. However, later it has been acknowledged that in many cases regional factors also condition the creation and use of knowledge, and so the term “regional system of innovation” has been regarded both as supplement and as an alternative the national system approaches (Edquist 1997).

It is worth noting that these approaches have a very clear foundation in the evolutionary economic tradition. Lundvall (1988 and 1992) explicitly argues that he seeks to develop an approach that is fundamentally different from the neoclassical economic theory. Furthermore, a basic assumption is as discussed above, that innovations are conditioned by both internal and external factors to the firms. This view is compatible with the evolutionary economic assumption that firms need to combine internal and external knowledge in order to innovate. The term search zone from evolutionary economic theories also fits well with the idea that political and cultural barriers will define patterns of interaction (e.g. Nelson and Winter 1982). Lastly, the assumption that firms are not equal, but belong to different innovation systems and have different positions within the innovation system, also corresponds with the evolutionary economic notion of heterogeneous firms with different knowledge bases (ibid).

Although there exists some confusion over the exact definition, the term innovation system refers to the all the elements that influence the innovation capabilities of firms (Isaksen 1997). It follows from this that even if the systems of innovations are composed of a number of different actors, the private-for-profit firm is at the heart of the systems. Lundvall (1992) suggests that the national systems of innovation comprise the structure of production and the institutional set-up. Much in line with this, a broad system approach usually includes the following determinants of innovation: Economic, social, political, organizational and institutional factors (Edquist 2005:182). It is worth noting that the term institution here refers to those elements that regulate the interaction between the actors of the system. Typically the term will comprise culture, habits, norms and laws (ibid). Furthermore, for a system to exist there must be a minimum level of coherence and persistence. Consequently, innovation systems also include the

features and links between the various factors, as well as the functions the systems are supposed to perform (e.g. Niosi et al. 1993, and Edquist 2005).

The definition of innovation systems presented here obviously bears much in common with the sector approach to innovation discussed in section 3.3. Especially recent publications, such as Merberba (2005) presented in section 3.3.1, appear to include many of the same elements that can be found in national and regional innovation systems. The most notable difference is of course that the sector approaches do not pay explicit attention to the geographic borders of the system. However, in many cases it can be argued that these sectors often have a clear national or regional base. For instance Pavitt (1984) develops his sectors on the basis of innovations taking place in Britain. It can further be noted that many countries and even regions, appear to be specialised in certain sectors, and so consequently many national and regional systems of innovation will mainly concern these sectors, e.g. Porter (1985).

A general problem is that the innovation system approaches are not very specific as to which relations that can be found and how these affect the innovation process. Nor is there any consensus over the exact functions of the systems. The approaches merely suggest possible links and encourage further research on these. However, the questions concerning the dynamics of the systems is further complicated by the fact that the innovation systems are assumed to differ on these issues. Edquist (2005:192) nevertheless argues that despite this lack of knowledge on the dynamics of the systems, it is possible to list the activities that can be found in innovation systems; among these are the provision of R&D, the creation of new knowledge, competence building, creating and changing institutions, the provision of access facilities and the administration of support for new innovative efforts. It follows that the innovation process according to this approach, is characterised by complicated feedback mechanisms and interactive relations involving science, technology, learning, production, policy and demand. In sum, it can therefore be argued that the system of innovation approaches implies that innovation is an extremely multi-causal and complex process (Edquist 1997).

The policy implications of system approaches are naturally concerned with the elements in the innovation systems and the relations between them. What complicates things further however is that technology parks according to these approaches, not only will perform so-called system policies, but they will also be a part of their respective innovation system. Accordingly, and much in line with the discussion of innovation policy within the evolutionary framework in section 2.3, the technology parks can therefore aim innovation policy at enhancing the internal innovation capabilities of the on-park firms, at their environment and\ or at the relation between the on-park firms and their respective innovation system. Again one would according to these approaches assume that the technology parks will have to differentiate and adjust policies to the particular firms located there. This requires the inquiring into both the particular needs of the firms and their links to their external environment. The parks may through courses and workshops aim to influence the internal functioning of the firms and their knowledge base, e.g. enhancing their general HR management skills, innovation management skills and more generally their absorptive capabilities. Again one may remark that all of these expectations are very similar to the ones made under section 3.2, 3.3.1 and 3.3.2.

Furthermore, based on the particular resource-base of the on-park firms, the policy of the parks may target the firms' relations to all of the aforementioned dimension of the innovation system; the financial, the social, education, research and development organisations and institutions. An important question in this respect will be whether all the relevant external linkages are established and exhausted. The technology parks may have several roles in relation to the external links of the companies located there: Firstly, they may act as brokers and help establish such links. Secondly they may help grow these links, i.e. to make them stronger. Lastly, they may act as the physical location of the links between the firms and their external knowledge bases, e.g. by offering locations for meetings, R&D or by housing the relevant external knowledge sources. All of these roles of course require that the parks too have extensive contact with the various important elements in the innovation systems.

A general problem is of course that the national and regional approaches to innovation, much like the generic theories themselves discussed in chapter 2, opens up for quite a range of different policies the technology parks may pursue. However, there seems to be a general agreements among researchers using these approaches that especially the universities, the higher educational institutions (hereafter referred to as HEIs), private and public R&D institutions, banks, venture capital and user-producers relations are of particular importance in the innovation process (e.g. Edquist 2005). Using these approaches, one would therefore expect the parks to have extensive contact with these particular organisations and that the on-park firms consider access and link to these as an important location factor. One should also expect that there exists particularly strong links or at least contact between the organisations located on the park, and that on-park firms are well embedded in the innovation system to which the parks belong and form a part of.

In sum one would therefore expect the management of the parks to take a strategic approach to the establishment and the follow-up of links and contacts between the on-park organisations and the on-park organisations and their external environment. It follows from these approaches that in order to be able to do this the parks need to have extensive contact with the various actors in the innovation system to which the parks belong and form a part of.

### ***3.5 Management Approaches to Innovation and Technology Parks***

Ever since the 1980s there has been a rise in the literature focusing on innovation as a strategic activity and a process to be managed (e.g. Tidd et al.1997: 49). They share an underlying view that innovation is crucial for firms` ability to compete and survive. It follows that innovation is considered to be a core business activity (e.g. Porter 1985). Furthermore, despite the somewhat messy character of innovation process, these approaches argue that innovation is a social and organizational process that can be managed in a consistent manner. In fact it argued that precisely because it is such a

crucial activity for every business, innovation must be approached in a strategic fashion from the side of the management (e.g. Utterback 1997).

According to these approaches, the innovation process should first and foremost be seen as a strategic choice based on an analysis of the relative market-position of the firm. The management needs to make a decision on what to innovate, when and how much resource they want to dedicate to innovation activities. When the decision to innovate is taken, the approaches then inquire into the potential problems and features related to innovation process itself, with the aim to find out how these best can be dealt with and how the innovation process should be organized. Moreover, the main issue within this perspective is how the management can and should structure the innovation process in order to encourage creativity and to ease the process as such (e.g. Allen 1977, Pavitt 2005 and Tidd et al. 1997).

Although it may be argued that the view on innovation as a core business process is very much in line with the basic premise of evolutionary economic theories, there are also some clear elements of neoclassical economic reasoning within these approaches. Most apparent in this respect, is perhaps the emphasis on innovations as a strategic choice made by the management of the firms. Through market analysis, the costs and benefits of innovating is compared to those of not by the management. It follows that that innovation is presented as a rational choice where the management will chose the option it believes will maximise the profit of the firm the in long run (e.g. Porter 1985 and Sundbo 1995:161). However, it can also be argued that some management approaches, much in line with evolutionary economic theory, stress that the choices related to innovation to a large degree are constricted by the technology base of the firms (e.g. Pavitt 2005 and Tidd et al. 1997). These approaches further argue that because the competence bases of the firms differs and the innovation process is inherently uncertain, there are no clear-cut answers as to which choices that will maximise the firms` profit. Consequently, it is contended, the strategy has to be learned and to a large degree adjusted along the way by the innovating organisation (ibid). Obviously as pointed out above, this view on innovation management draw on elements from the evolutionary theories, which emphasis that the firms` innovation processes and

therefore also innovation management, to a large degree differ and are conditioned by their respective competence base and the routines already established (e.g. Nelson and Winter 1982).

It therefore appears as though the management approaches differ somewhat in their view on the degree of freedom that the managers are believed to have when it comes to management and making choices in relation to innovation. However, it can nevertheless be argued that a common feature of these approaches is that they assume that innovation strategies must be lined out by the managers. Moreover, it is believed that the choices made by the managers, both in relation to innovation and more in general, are based on utility and costs considerations. It follows that it is assumed that the managers are able, within the limits given by their market position and technology base, to maximise the profit for the organization to which they belong by making the right innovation choices. Obviously, this sort of rationale is compatible with the neoclassical economic view on firms.

The management of the innovation process, and consequently also the potential role of technology parks, does however vary somewhat according to which aspects of the innovation process are stressed by the various authors. In an influential study, Allen (1977) for instance approaches innovation management by inquiring into the working of engineers in the R&D laboratories of large firms. He argues that innovation is essentially about information, and that success is strongly correlated with good information flow and communication throughout the R&D project. Allen (1977) also highlights the importance of face-to-face contact and informal communication between the engineers. He further suggests that certain key-individuals are especially central in the networking and flow of information. These key-individuals collect information from various sources and pass it on to the relevant people who will be best able and the most interested in using it. He labels these people “gate-keepers” and argues that it is important for the management to try to reduce the cost related to the information flow, as well as to encourage the work of these key-individuals.



In a more recent publication on innovation management, Tidd et al. (1997) contend that even if the innovation process vary between firms, innovation will nevertheless have to pass through four phases; 1. A scanning phase which is concerned with spotting signals in the environment. 2. A strategy phase where a selection is made between the various technical and market opportunities, and where these are made sure to fit with the overall business plan. 3. A resourcing phase in which new and existing knowledge is combined in order to solve problems. 4. The implementation phase where the initial ideas and knowledge is developed into an innovation and prepared for the market. 5. The last phase is called learning and re-innovation, and is an optional phase according to Tidd et al. (1997). It is argued that that in phase 6 the outcome of introducing the innovation to the market may trigger the restarting of the innovation cycle. It should be noted that while Allen (1977) studies technical innovations, Tidd et al. (1997) take a broader view on innovation by including technical, market and organizational innovations, defined both as new products and new ways in which these products are produced.

The innovation model lined out by Tidd et al. (1997) can be criticised for portraying to innovation process as too linear and tidy. Pavitt (2005), one of the authors, has later emphasised that the innovation process should not be described in phases, but rather as partly overlapping and intertwined sub-processes. The point here however, is that these phases or processes according to Tidd et al. (1997), can be managed by establishing good enabling routines. These routines are clustered around the following 4 themes; Strategies concerning innovation and the problems of its managements, routines aimed at building effective linkages with the outside, mechanism concerned with the implementation of the innovation and a supportive organization for innovation.

It can be noted that both Allen (1977) and Tidd et al. (1997) are quite general and vague in their discussion. For instance the authors go through various costs and benefits related to different organizing forms of the R&D departments, but they are not specific on when the various designs should be chosen. However, it is possible to make some suggestions on how technology parks may be viewed according to these two management texts. Allen (1977) implies that the technology parks best can help the innovation process in the organisations located there, by focusing on their R&D

activities. More precisely, the focus should be on how they can increase the informal and face-to-face contact between engineers, both within the firms and between the companies. This can be done in several ways. Firstly, one would expect the general layout and architecture of the parks to be constructed in such a way that will encourage the interaction of R&D people both by inside and outside of the company. For instance one would expect to find shared R&D facilities between firms. Furthermore, one would also expect the physical architecture of the park designed in such a way that it ensures the travelling paths of the engineers both inside and outside the company to meet and get to know each other. It can for instance be expected to find common eating areas and sporting facilities. Shared services such as receptions and meetings rooms would also be expected to find. Again it may be remarked that these expectations are quite similar to the ones derived from the entrepreneurial and the biotechnology sector approach.

Furthermore, one would also according to Allen's findings expect the parks to arrange courses and work-shops between key individuals and engineers in general, aimed at lowering the costs associated with face-to face interaction and knowledge exchange. According to Allen (1977), costs are especially related to the loss of prestige and lack of awareness about which people to consult. One would therefore expect both workshops and social areas that encourage the interaction between staff of the various organizations in order for them to get to know each other. In general, one would therefore also expect the technology parks to have close contact with the managers of the R&D departments of the on-parks organisations, both in order to enquire into their particular needs and to establish dialogue on aspects of the park that may be improved. Lastly it can also be expected that the technology parks may function as gatekeepers themselves. They may for instance encourage knowledge flow by having an on-park library and by having contact with leading knowledge institutions in relevant areas.

Using Tidd et al (1997) as a starting point, one would expect the main functions of the technology parks to be related to the establishing of the so-called enabling routines briefly discussed above. Notably, the expectations based on Allen's (1977) work on the technology parks' role are also compatible with the expectations which can be drawn

from the work of Tidd et al. (1997). However, it should be pointed out that they appear to present a much more cooperative wide view on innovation. Innovation does not only involve the R&D department of an organisation. Increased interaction and information flows both internal and external to the innovating organisation, is therefore not only necessary among the R&D staff, but at a firm wide level.

In sum one would therefore expect the technology parks to offer facilities that encourage contact between people working in the on-park organisation through shared meeting rooms, laboratories and eating areas. Furthermore one would expect the technology park to have extensive contact with the on-park managers both in order to arrange general management courses and inquire into their needs for external contacts. And lastly, the park may act as gatekeepers by having an on-park library and by establishing contact with leading knowledge institutions.

### ***3.6 Comparison and Five Propositions***

The most striking difference between the four perspectives is the relative emphasis they put on various factors in the innovation process. Notably, the entrepreneur literature on NTBFs tends to emphasise the skills and psychological profile of the key-founder much more than the other approaches. The sector approaches on the other hand especially emphasise the technology bases of the firms, and how these affect the innovation process. The innovation system approaches put a larger emphasis than the other three streams on the political factors and institutions, i.e. cultures, laws and norms. And lastly, the management approach emphasise good communication between all actors involved in the innovation process and the importance of a strategic approach to innovation from the side of the management. It can be added that these differences in the perception of the innovation process to a certain extent is linked to the definition of innovation underlying these approaches. While especially the NTBFs will emphasise rather radical product innovations, the system approaches evolved from the study of incremental innovations, i.e. innovation that represent small changes (Lundvall 1988). The sector approach lines somewhere in the middle, and understands the term

innovation both as product and process innovations. While typically newer innovation management literature have a quite broad view on innovation including technical, market and organizational innovations (e.g. Tidd et al. 1997).

However, perhaps more striking than their differences, are the similarities between the four perspectives. All of the approaches emphasise innovation as complex social process involving various actors combining both external and internal use of knowledge. The similarities between the four approaches are also apparent in the various discussions on how the technology parks may function as innovation policy. As pointed out in the discussion many of the same conclusions are reached. Perhaps with the exception of the management approach, these similarities can to a large degree be attributed to their common theoretical basis in evolutionary economics. As for the management approach, arguably the approach the most influenced by a neoclassical rationale, it too is based on some evolutionary economic thoughts. It follows that although not all of the authors discussed take an explicit evolutionary theoretical stand, and even if parts of their rationale can be labelled neoclassical, much of their reasoning is nevertheless compatible with evolutionary economic theories. Most notable perhaps, and in contrast with the neoclassical economic theories, is it that the four approaches do not regard technological knowledge easily accessible. Rather they emphasise that knowledge both is firm specific and general, and that the firms' knowledge bases will differ. This also implies that although the innovation process is highly uncertain, it is to a large degree path dependent. Therefore, what the firms do today will highly influence what they do in the future. Furthermore, the emphasis on innovation as an interactive process involving both internal and external actors is also much in line with evolutionary thinking. In sum the interactive learning element implies that the firms need to be open both to internal and external ideas and sources of knowledge.

Based on these four perspectives on the innovation process, one may line out some expectations concerning the role of technology parks as innovation policy. These are ordered into the following five propositions:

1. The parks take a strategic approach, i.e. have a clear and well-founded stand on sectors and firms they allow and wish to have located on the park.
2. The parks differentiate policies in order to adjust them to the particular needs of the on-park organisations.
  - 2A. The parks will emphasise contact with the management of the companies, both in order to inquire into their needs and to arrange management courses.
  - 2B. In the case of NTBFs one would especially expect the parks to offer help to increase the market skills and develop business plans.
  - 2C. In order to attract more NTBFs from the biotechnology sector, one would expect the park to especially emphasise their affiliation and connection to the local university and research institutions with links to the biotechnology sector and to have an incubator aimed at this sector.
3. The parks take a systemic approach to innovation policy.
  - 3A. It is expected that they emphasise extensive contact with the leading HEIs, universities, banks and venture capital in their respective systems of innovation.
  - 3B. It is also expected that an important location factor for the on-park organisations is access to resources such as the university, public funding, infrastructure and on-park knowledge exchange.
4. The on-park organisations are well embedded in the innovation system their respective parks form a part of.
  - 4A. It is expected that the on-park organisations have extensive contact with the local HEIs and universities and research centres.
  - 4B. There is extensive contact and collaboration between the organisations located on the park.
  - 4C. Lastly, that the location also ensures proximity to clients as well as good opportunities for new ones.

5. The parks are designed to increase communication and integration between on-park organisations.
  - 5A. There are common meetings-room, laboratories, eating and sports areas for the on-park organisations.
  - 5B. The parks act as gatekeepers by having library and contact with important knowledge institutions.

## **4 Methodology**

In this chapter I will briefly outline the methodology used. Firstly, the research design will be presented and discussed. Secondly, the choice of interviewees will be commented on and presented. Lastly, I will very shortly go into the design of the interviews and the survey.

### ***4.1 Research Method***

This study is a single-case study, where the case is defined as The Technology Park of the Basque Country. A case-study design was preferred due to nature of the research question. As discussed in the introduction, I aspire to inquire into how the technology parks may function as technology policy. In order to this I need to do an in-depth study on how the on-park organisations perceive their location and how the management work. Obviously, by inquiring into the working of several technology parks, I would have been better able to get a picture how they work. However, due to the limited time and scope of this thesis, a single case strategy was chosen. It was several reasons why the Technology Park of the Basque Country appeared as an interesting case for my study. It is a well-established park, which by the year 2001, was expected to be well pass the start-up problems and assumed to have reached as state of stability, with a well-defined strategy and vision of what it can accomplish. It has for instance been argued that technology and science parks do not reach this stable state before 10-15 years after

their launch (Halvorsen and Lacave 1998). Furthermore, it is considered a successful park and has served as a role model for other technology parks both in the Basque Region and in the rest of Spain. Lastly, it is also a significant case when inquiring into the working of technology parks as innovation policy, as it was explicitly set up by various public institutions in BAC in order to increase innovation (see chapter 5).

Furthermore, in examining the issues at stake, I have also sought triangulation, here defined as approaching the case from different perspectives, e.g. by using several empirical sources, methods and theoretical perspectives (Yin 1989:93). The aim of this is of course to get a richer understanding of the technology park. Accordingly, the material used to inquire into the working of the Technology Park of the Basque Country stems from two types of sources; interviews and a survey. I interviewed the Innovation Manager of the park, Mrs Angeles Ibarrondo and six on-park organisations. The interviews, carried out in the spring 2001, were semi-structured and lasted between 20 minutes and one hour. The innovation manager was interviewed in two rounds and this gave me the possibility to go in more depth on issues and follow-up questions that appeared unanswered after the first round. The semi-structured interviews were meant to give voice to different types of on-park organisations and their reflections around the possible added value of being located in the park.

A questionnaire was sent out, spring 2001, by fax and mail to all of the on-park organisations except for those interviewed. The main objective with of the survey was to include businesses from a wider range of sectors than those covered by the interviews. A common problem related to questionnaires sent out by mail and fax is low response rate (e.g. Mordal 1989). This was also the case with the Technology Park of the Basque Country, as only 23 of the 95 requested filled out the questionnaire. It follows that the results from the survey might not reflect the opinion of the park as a whole. It is especially notable that the survey is biased towards small engineering and software firms. Moreover, while the aforementioned sectors are somewhat over-represented, very few large international companies in the telecom sector responded to the survey. Furthermore, another general problem with surveys is that one cannot control who responds to these surveys, nor correct the respondents if they

misunderstand the questions posed in the survey (ibid.). And although, I did detect a few misunderstandings, these only concerned minor questions in 3 questionnaires. As for those responding, it can be noted that the distinction between management and technical staff is often blurred in small firms (e.g. Monch et al. 1988). If this is the case then it might not be so critical who filled out the forms in my particular case, as those who responded were mainly small firms. Despite the weaknesses pointed out above, I nevertheless chose to include the result from the survey in the discussion of the empirical findings. This was mainly done because the survey covers more sectors than I was able to do in the interview, and hence is believed to add to the findings from the interviews. However, because the survey cannot be said to represent the population of on-park organisations, I only refer to the respondents of the survey in the empirical discussion and interpret the findings from the survey merely as tendencies rather than clear-cut results.

## ***4.2 Choice of Interviewees***

The interview with the innovation manager of the park was done in order to shed light on how the management themselves view the role of the park and to inquire into their strategies. Obviously an important methodological question is whether the interview represents the view of the management as a whole, or just the interviewee. I cannot of course be sure of this, and a better option would have been to interview more people in the management. However, I do consider Mrs Angeles Ibarrondo to be representative for the management as it only consists of 12 people.

Another general concern is that there is a fair chance the representative from the management aspired to present the park in a good light during the talk with me. This might imply that she avoided telling me things or elaborated more thoroughly on issues she felt the park was good at. This was for instance a concern when asked about the park's admission policy. However, I feel that this is somewhat compensated by also collecting data from other sources. Furthermore, the answers given by Angeles Ibarrondo are obviously interpreted by me and presented within the theoretical



framework of this thesis. It should therefore be noted Mrs Angeles Ibarondo has not read through my presentation and might disagree with some of my interpretations. However, as it was never agreed that she needed to approve the thesis and as the data now is 4 years old, I decided that this was not urgent.

The interviews with the on-park organisations were meant to give voice to different types of on-park organisations and their reflections around the possible added value of being located in the park. Although I only did six interviews with the on-park organisations, I believe that they at least give a clue on how the park works. The organisations were guaranteed a certain degree of discretion and therefore do not appear by name. However, they can roughly be described as follows; two business-consulting companies, two private-public technology institutes, one telecom-company and one service-company.

The people interviewed mainly belonged to the management, with the exception of two interviewees. Although I preferred to speak to someone in the management, mainly because I believed that these would be more familiar with the most important reasons behind the decisions to locate in the park, I included an interview with press-contact because she appeared to be well updated and had opinions on how the location benefited her organisation. The interview with the other person that did not belong to management was included because this was a small service company. I therefore presumed that he was up-dated on some of the strategies of the management.

### ***4.3 Design of the interviews and survey***

The design of the interviews and the survey was to a large degree based on previous studies of technology parks and on-park organisations (e.g. Monch et al. 1988). However, I adjusted the questions to the particular case and the research question concerning technology parks as innovation policy.

The interviews with the six on- park organisation and the survey therefore mainly concerned the following location dimensions:

- The most important factors behind the decision to locate on the park
- How pleased they are with the following aspects of the park:
  - Proximity to clients and possibility of new
  - Recruitment
  - Cooperation with HEIs and public institutions
  - Costs
  - Image
- Whether they have contact and type of contact with the other on-park organisations
- Contact with various regional public institutions in the Basque Country
- Their general impression of collaboration between the on-park organisations.

## **5 The Case**

### ***5.1 Introduction***

In this chapter I will briefly present the background for the establishment of the Technology Park of the Basque Country and the political setting in which the park is embedded. I will then look at the origin of the technology park concept and very briefly inquire into some of the findings done on the effects of these parks. Lastly, some features of The Technology Park of the Basque Country are presented.

### ***5.2 Background***

The Basque Country as referred to in daily speech, i.e. the territory in which the Basque language and culture historically used to be dominant, is divided between Spain and France. The south part is situated in the north west of Spain and covers two autonomous communities, respectively Navarre and the Basque Autonomous Community. While complying to Spanish law, a system of historic privileges renders the Basque

Autonomous Community the right to administrate a large amount of public spending. The community also exercises a large degree of freedom in various policy areas related to economic development, such as technology, innovation and industry (Coke et al. 1997). The responsibility for formulating these policies, are however divided between three different administrative and political levels in the community. These are a common government for the whole community, three provincial councils and lastly, the commune level, comprising small towns and areas of the larger cities.

The Technology Park of the Basque Country was set up in 1985 as public company by all three political levels in the Basque Autonomous Community. The park was the first of three established in the Basque Autonomous community, hereafter referred to as BAC. To day there is one technology park in each of the provinces, and the three of them together form a fundamental part of the policy aimed at economic development in the area (e.g. Uranga and Etxebarria 2000: 521).

As with the particular case of the Technology Park of the Basque Country, the establishment of the park must be seen in relation to BACs regeneration policy. The economy has traditionally been dominated by heavy industry, and was consequently struck especially hard by the economic recession in the 1970s (ibid). Following this, an important goal of the regional policy from the early 1980s and onwards, has been to create regional growth through a diverse and prosperous business base (www.bm30.es). Accordingly, the original mission of the Technology Park of the Basque Country was formulated as three goals (e.g. Parque Tecnológico 2001). The park is to contribute to:

1. Industrial diversification towards advanced technologies in BAC
2. Contribute to technology transfer
3. Innovation.

Though it is not specified exactly how the park is to achieve these goals, it is worth noting that even if the park has changed quite dramatically both in size and with respect to the companies located there, the mission is still very valid today (ibid).

### ***5.3 The Origin of the Concept and the Technology Park of the Basque Country***

The Stanford Research Park in the US is widely acknowledged as the first technology park and was opened by the Stanford University in 1951 (e.g. Lugar and Goldstein 1991:123). Notably, the park did not develop out of a grand plan, but has been described as the result of various local interests (ibid). The significance of Stanford Research Park however, goes beyond the fact that it was the first of its kind. Equally important is it that the park has been credited an important role in the development of the Silicon Valley as business centre for so called high-technology firms in the US. Although it should be remarked that the park is not Silicon Valley, it houses several of the region's most successful firms. As a consequence, the conception of technology parks as important tools for regional development have to a large degree grown out of the success story of the Stanford Research Park in the Silicon Valley (Ferguson 1999:15). It should be remarked however, that the research on these parks suggests that "Silicon Valleys" are far in between (e.g. Massey et al 1992 and Monch et al. 1988). And a general critic has been that technology parks often appear to have few ties to their immediate surroundings and in that sense function as enclaves. Furthermore, several studies have suggested that the on-park location do not have the alleged added value on high-tech firms compared to those located out-door (ibid).

Nevertheless, the success story of Silicon Valley has been important for the establishment the Technology Park of the Basque Country. When the park was set up in 1985 it was one of the first in Spain, and consequently was very much inspired by the pioneering parks in the US and UK, with the Stanford Research Park being the most widely known example (e.g. Parque Tecnológico 2001 and interview with Angeles Ibarrondo). It is aimed at being a natural park with a great amount of green space and is situated close to the small towns Zamudio and Dario. By 2001 the park covered over 190 hectares and encompassed 35 different buildings, 8 of which the park itself owned. Although many companies located in the park own their own buildings, they are not

allowed to sell these buildings without the approval of the park. The Park is organized as a public company, with different public institutions holding a certain % of the shares. The most important shareholder is the government of the Basque Country represented through SPRI. SPRI is a government agency set up to promote business and diversify the industry of the region, and is the largest shareholder with 75% of the shares. The second largest is the County council of the Bizkaya with 24% of the shares. Lastly, the original owner of the land, Town Hall of Zamudio, is represented with one % of the shares. The daily running of the park is the responsibility of the general manager and the president of the park. The management counts 12 people, all with different areas of responsibility. While the daily running of the park is the responsibility of the general manager, the strategic decisions concerning are taken by the commission, also referred to as a board of directors. The commission is composed of the following members; a representative from SPRI, the local county council, vice rector of the University of the Basque Country, the general manager and the president of the park (ibid).

By 2001, 101 different companies and organisations were located in the park. More than 4000 people were at the time working there, of whom approximately 50% were graduates and 30% working in R&D. When the park first was set up the majority of the companies there were foreign. By 2001 this had changed however, with the majority being Spanish organisations and companies. By 2001, the majority of the firms belonged to the IT and telecom sector, with nearly 53% of the employees in the park at the time. The second largest sector by 2001 was electronics and advanced engineering with 20% of the direct employment. The third largest sector of organisations was aeronautics, with 13% of the employment in the park. The environment and biotechnology sector, defined as future industries by the commission of the park, counted only a few firms in 2001 (ibid).

## **6 Discussion of the Empirical Findings**

### ***6.1 Introduction***

Based on the four perspectives lined out in chapter 3, it was expected that an important role of technology parks in relation to innovation policy is to function as networks builders. By taking a strategic approach as to which types of companies they wish to attract and by focusing on the characteristics and needs of these, their assumed aim is to establish an innovative local network both on and around the technology park.

Furthermore, as all of the streams also emphasise differences between firms in the innovation process, the technology parks are also expected to adjust their network building to the particular on-park organisations. These expectations, formulated as propositions in section 3.6, will be discussed in the following section against the empirical findings from the Technology Park of the Basque Country. Therefore, the main aim of this section is to investigate whether the Technology Park of the Basque Country function as innovation policy the way envisaged by the four perspectives discussed in the chapter three, or whether it takes on a different role.

The interviewees and the participants in the survey were guaranteed discretion. The names of the interviewees and the companies, with the exception of the innovation manager Mrs Angeles Ibarrodo, therefore do not appear throughout the discussion of the empirical findings. For a further discussion of the methodology and details on the survey and interviews see the appendix and the methodology chapter.

### ***6.2 Let-in policy***

As discussed in 3.3, the firms that belong to the same sectors are believed to have much in common, e.g. when it comes to knowledge sources used in the innovation process,

links between actors and the main features of the knowledge base (e.g. Pavitt 1984 and Mareba 2005). Based on the discussion in chapter 3.3, it was assumed that the technology parks take a strategic approach as to which sectors and firms they allow and wish to have located on the park. This is formulated as proposition one in section 3.6, and the aim with such an approach is to ensure technological links and connections between the on-park organisations.

Consequently the question in this section is whether the Technology Park of the Basque Country has a clear stand and restrictions on which types of organisations and sectors they allow in and wish to attract, or whether they have a more loose let-in policy.

When asked about the park's admission policies, Angeles Ibarrondo, the innovation manager of the park, replied; "No companies are formally prohibited, though all companies are evaluated before they are accepted. The companies accepted belong to the so called future- industries." Notably, when asked to further elaborate on this policy, she could not specify exactly which criteria used in the admission process, or how they defined the "future" industries. Now obviously there may be several reasons for this, either she was not sure which criteria were used in each case or she considered it a delicate or an internal matter, and consequently did not want to go into more detail. Without going into too much speculation over this matter, it should be pointed out that with a management consisting of only 12 people and where this policy obviously also concerns the work of the innovation manager, it is hard to think that such an important matter is never discussed. She did however add that she was not so worried about attracting tenants, but more about making them stay. This again may imply that stability is valued in the selection process of the firms.

Angeles Ibarrondo further emphasised that it was the board of directors, comprised of the government agency SPRI, the vice-rector of the Basque public university, the general manager of the park and the president of the park, which defined the so-called future industries. Consequently, the selection of sectors was not a matter the management could act freely on. She added that the commission had recently defined telecommunication and biotechnology as future industries. She also pointed out that

apart from ITP, a large aeronautic firm, the companies accepted only have a small manufacture share.

Although the representative from the management was somewhat vague on the admission policy, several things point in the directions of a rather loose letting-in policy. Firstly, several of the interviewees from the on-park organisation pointed out that that the park had nearly doubled in size the last couple of years. While this was often mentioned in relation with discontent about lack of parking space, one of the interviewees explicitly claimed that the increase in the number of tenants was due to a change towards a more loose let-in policy; “Two years ago the park dropped the technical and innovative criteria for accepting companies. Consequently, the number of tenants grew quickly and so did the number of people working here.” Numbers from overhead brochures given to me by Angeles Ibarrondo also prove that there has been a quick growth in the number of companies over the last 5 years, moving from 57 on-park organisations in 1996 to 101 in 2001. The same overheads also indicate that 100% of the premises are occupied in year 2000, something that much be considered very high.

Secondly, the impression of a loose let-in policy was further underscored when looking closer into the business activities of the on-park companies. The survey, the interviews and the internet-pages of the on-park companies, confirmed that quite a few of the tenants were pure sales offices conducting no R&D. For instance, in the survey two companies reported the sales were their only business activity. Furthermore, I interviewed a service company that did no R&D. And lastly, it was clear from several of the on-park organisations` internet-pages that they were only occupied with sales, e.g. Erictel. Notably, those tenants who functioned as sales offices were not only small and local sales companies, but also included so called multi national companies, MNCs. Consequently, although the MNCs could be labelled innovative, there were several cases where it was clear that the affiliation located in the technology park functioned as a sales office, an example of this was Alactel.

Thirdly, when asked about their general impression of collaboration in the park, several of the interviewees noted, in line with the sector perspective in section 3.3, that there



were so many sectors and types of organisations represented, that there was no logic link between them and so that the contact would be limited by this. Obviously, this also points in the directions of a quite loose let-in policy. By looking at company directory available at their internet-pages in 2001, the lack of logic links between many of the organisations was further underscored. According the company directory the 101 companies represented in the park belonged to 11 different industrial sectors ([www.parque-tecnologico.net](http://www.parque-tecnologico.net)). Now obviously, the exact sector-division used by the technology park on their internet-pages can be debated. However, it is nevertheless clear that with the companies and organisations representing as different sectors as; telecommunication, biotechnology, aeronautics, engineering and automotive, it is hard, especially according to the sector perspective on innovation, to imagine a lot of contact in terms of knowledge exchange between companies in this various sectors. This was also confirmed in the interviews and surveys, where no companies reported to have contact which involved joint research and knowledge exchange with on –parks companies beyond the their own sector.

Lastly, it can be noted that the letting in-policy is likely to be highly influenced by the organisation of the technology park itself. As mentioned in the presentation of the technology park, the companies themselves own a large majority of the buildings. The arrangement of owning rather than renting implies that only quite large companies that are financially strong, will be able to access this area of the park. Although this by itself does not mean that the park has a loose let-in policy, it certainly indicates that the selection process will be strongly biased towards large and financially strong organisations, rather than sectors as was expected on the bases of the theory.

It should be noted however, that the park has taken several steps in order to attract more companies belonging to biotechnology business. For instance, when I spoke to Angeles Ibarrondo the park was in the process of building an incubator solely aimed at biotechnology firms, with fully equipped laboratories. This may imply a more conscious policy as to which sectors the parks wishes to attract in the future.

In sum however, the park appears to be quite vague on the criteria used when companies are accepted as tenants. Many indicators point in the direction of a quite loose let in policy, both concerning which sector the park allows and types of business activities. Why then is this the case, when according to the theory in chapter 3 a strategic approach to sectors and types of organisations allowed on the park is important if the technology parks are to function as innovation policy? There may be several reasons for this. Most technology parks are expected to make earnings from rent, and this of course is a problem if they have a hard time finding the right companies for their park due to strict admission terms. Furthermore, having too much free space will not encourage the right companies to come either, as this will imply a complete lack of dynamic environment and synergies. In the case of the Technology Park of the Basque Country it appears as though there was a wish to increase the number of the number of tenants quickly and so it was opened for a more loose let-in policy. Whether this was due to financial considerations or other matters, it is hard to tell from the empiric data in the section above. Though it can be noted that according to Angeles Ibarondo, the year 2000 was the first profitable for the park.

Therefore it appears clear from the evidence discussed that the establishing of a letting-in policy is a delicate matter that needs to take more than innovation policy into consideration. In the case of the Technology Park of the Basque Country there are indicators pointing in the direction of other matters, such as stability and income, being more decisive for the letting-in policy than innovation policy *pr se*.

### **6.3 Differentiation**

As pointed out in the section above and discussed more thoroughly in chapter 3, firms innovate differently. Hence for the parks to function as innovation policy, it is therefore expected that the technology parks differentiate their policies in order to adjust them to the particular needs of the firms located there. In proposition two in section 3.6, it was

suggested that the parks would emphasise contact with the management of the companies, both in order to inquire into their needs and to arrange management courses. More particularly, in the case of NTBFs it was assumed that the parks would aim policies at increasing the market skills of these companies and offer them help to develop business plans. And furthermore, in the case of the NTBFs in the biotechnology sectors, it was expected that the parks would emphasise affiliation with the local university and other institutions with links to the biotechnology sector.

The question in this section is therefore whether the Technology Park of the Basque County offers various services adjusted the particular needs of the companies, or whether they chose to take a more passive and standard caretaker role.

When asked which services they offer the companies, Angeles Ibarondo, quickly listed standard services such as cleaning, a general reception area, maintenance, postal services, security, up-to-date telecommunication infrastructure, cafeterias and catering services. In addition, she also mentioned the types of services offered by some of the on-park service companies, such as bank services, copy centres and sport facilities. She further pointed out that they were in the process of putting up a new restaurant and hotel on the park property. It appears from her quick listing that it is the technology park as a caretaker that first comes to mind when asked about services offered to companies.

However, the park also offers more specialised services for business activities such as; meetings-rooms of various sizes with technical equipment, an auditorium, video-conference room and a social club. Though, it should be noted that these services are not standard and need to be booked in advance by the tenants themselves and also that they are not free. Nevertheless, my impression from the interviews was that these types of services were seldom used. All of the companies interviewed said they used their own meeting rooms when receiving clients. Again however, these somewhat standard services, point in the direction of the park as a caretaker, more than adjusting services to the particular needs of the on-park companies.

On the other hand, there are also some implications of the park taking a more active role and trying to adjust their services towards the different needs of their tenants. For instance, the last four years the park has arranged various types of training-courses for the on-park companies. Angeles Ibarondo emphasised that these were offered at a very low price, usually at less than ½ of what was one normally would have to pay for them. The courses arranged by the park have mainly been aimed at the managers of small and medium sized companies and she listed the following examples of courses; business management, marketing, HR, project management and language courses. She also added that there had been a shift in the type of courses offered, from basic courses to more specific and high-level courses. Although it can be noted that these courses seem pretty standard, aimed at small and medium sized companies in general and not at the particular sector or based on specific needs expressed by the on-park companies, it certainly implies that the park takes a more active role as expected in the theory.

Furthermore, the park also aims to take a more active role towards NTBFs in the biotechnology sector. The park has established formal collaboration with the Biotechnology Centre of Excellence in Massachusetts and the University Science Centre of Philadelphia, which have an international reputation as experts in biotechnology. Angeles Ibarondo did not elaborate on what exactly these collaborations involved, but they are a part of a general emphasis on the biotechnology sector, and a wish to offer better services and attract more firms from this sector. Furthermore, as I spoke to Ibarondo the park was in the process of building an incubator especially aimed at the biotechnology sector. The incubator would be set up in close collaboration with a local bank, the government agency SPRI and a public organisation put up to support new start up firms. The goal was to be able to offer extensive support to the start up of NTBFs in the biotechnology business, e.g. by training courses, access to seed-capital and fully equipped laboratories. In this sense, one can argue that even if there were no special support to NTBFs in the biotechnology business at the time, there was action taken aimed at creating a more active and specialised policy towards these firms.

However, at the time speaking to Angeles Ibarrodo, the technology park did not offer any specialised services such as help to develop a business plan to NTBFs as expected. She added that it was not really the task of the technology park to follow up all the NTBFs present there, as this was already done by BEAZ, another public institution in the Autonomous Community of the Basque Country. She did however add that the park has close contact with BEAZ, both formally and informally, and so they could exchange opinion on matters. Notably, she expressed that there was a wish from the side of the park management to focus more on services to NTBFs, both spin-offs from university and spin-outs from more established firm. However so far, this had not yet resulted in any concrete actions towards the NTBFs.

The lack of specialised support to the companies was also apparent through the interviews with the on-park organisations. None of the organisations interviewed mentioned that they had participated in the courses arranged by the park. Also when asked whether they considered the management of the park helpful or passive, they often expressed a discontent over practical matters such as lack of parking spaces. It appears from this that the companies interviewed first and foremost perceived the management as a care-taker.

In sum, one may therefore conclude that the empirical data suggests that even if the park offered training courses aimed at the management of small and medium sized companies, and even if there was a plan to take on a more active role towards NTBFs in the biotechnology sector, it nevertheless appeared as though the management at the time of the study had more of a passive care-taker role. There may be several reasons why at the park did not have a more specialised policy towards various types of firms and sectors, as was expected in chapter 3. Firstly, there are other organisations in BAC, e.g. BEAZ, which was set up to help new firms. Furthermore, it may again be a financial question, offering extensive support for NTBFs requires money and resources. Though it is notable that there is action taken in the direction of a more specialised services.

## **6.4 A systemic perspective**

As discussed in chapter three, firms do not innovate in isolation from their environment. It was argued that the parks are a part of an innovation system and are expected to emphasise close contact with important actors in the innovation system, such as leading HEIs, universities, banks and venture capital. In the case of the Technology Park of the Basque Country it has been argued that it forms a part of the regional Basque System of innovation (e.g. see Uranga and Etxebarria 2000). It was further assumed that an important aim for the parks is to ensure access for the on-park companies to these actors in the innovation system. Consequently, it is expected that an important location-factor for the on-park organisations is access to regional resources, such as the university, public funding, infrastructure and on-park knowledge exchange.

When asked about the park's relation to the public university, Angeles Ibarrondo said that the management has close contact with the public university (UPV), through regular meetings and information about ongoing projects between the university and the on-park organisations. She added that the last three years the park has been more proactive in their efforts to establish contact between the companies in the park and the university. Hence, they mail the companies in order to inquire into whether they want to participate in various projects with the university. Previously it was normally the companies that contacted the management of the park if they wanted to do a project with the university. There are also regular meetings, arranged by the management of the park, between the university and the on-park companies. The main aim of these meetings is to give the parties an opportunity to present what they can offer each other. She emphasised that the management of the park felt that it was especially important to help the public university communicate with the companies, because the private institutions were able to this themselves.

However, it should be noted that Ibarrondo added that although they emphasise close contact with the university, the main objective of the technology park was not to

facilitate flow of knowledge between the university and the on-park companies. This view was also apparent when she was asked about the park's promotion strategy. She said the park usually profiled their physical closeness to the airport and Bilbao and the countryside environment of the park, rather than affiliation with the public university. It follows that although close contact with the university is valued, other elements are considered more important both in the work of the park and in the promotion of it.

As for the contact with other elements in the regional innovation system, Ibarondo did not go into details on this. She did however mention that they did collaborate with the regional bank BBK, and that BBK was also involved in the setting up and planning of the incubator for biotechnology firms. Furthermore, it appears clear that they have good contact with the regional and local political institutions, both formally and informally. Political institutions such as SPRI, is both a stakeholder and represented in the commission of the park. As discussed in 6.3, it has both informal and formal contact with the public organisation BEAZ set up to support new firms. Furthermore, the park has actively been used in regional economic strategies. For instance as mentioned in chapter 5.2, it was set up as a part of a regional strategy to diversify the industry in BAC. Secondly, it has now become an important player in the in order to reach the goal "BioBasque", i.e. to encourage the growth of the biotechnology sector in the autonomous community. And lastly, many public and private-public organisations are located on the park, such as the 4 Technology Centres and SPRI itself. In this sense it can be argued that the technology park seems well integrated into the regional innovation system.

However, it was also expected that main motivation for locating on the park would be access to important elements in the innovation system, such as the university, public funding, as well as contact with the other on-park organisations. When asked about the most important locations factors, none of the 6 organisations interviewed, mentioned the access to university or contact with the other on-park organisations. One organisation, a consultancy firm, mentioned public funding as the most important location factor, while the others listed the following aspects; good facilities, possibilities to extend localities when needed, the natural surroundings and closeness to the airport.

The survey revealed the same tendencies, the difference here was of course that I asked them to evaluate various location factors; hence they were not free to list those they meant were the most important. Interestingly, many of the same tendencies could however be observed. For instance, none of the 23 on-park organisations replying to the questionnaire listed contact with the university as a very important location factor. However, it should be added that 8 of the 23 considered it to be a somewhat important location factors. Notably, these 8 belonged to different sectors. However again, it can be remarked that equally many, i.e. 8 of 23, organisations answered that the contact with the university was of no importance, and again the firms with this opinion belonged to different sectors. However, contact with other on- and off-park organisations, were listed as very and quite important by 11 of the 23 respondents, and again these respondents belonged to different sectors. About the same nr, 12, listed the possibility for public support to be very or somewhat important as a location factor. 11 listed costs as somewhat important. Most notable however is it that 20 of the 23 respondents listed image as very or a somewhat important location factor. It follows that image appears as the single most an important location factor for almost all of the respondents.

In sum, it might be argued that technology park appears to have good relations with institutions in the innovation system as expected on the basis of the discussion in chapter 3. According to the theory, this should form a good basis as innovation policy. It is therefore somewhat surprising that 1\2 of the respondents asked, did not consider access to various important actors in the regional innovation system as an influential location factor. In fact, the only clear location pattern was image, which 20 of the 23 organisations considered influential. It appears that, contrary to what the innovation theories lined out, that the on-park organisations surveyed did not consider the park as a valuable way to access regional resources. This of course prompts further question as to what the on-park organisations can gain from being located on the park, both in relation to innovation and in other areas.



## **6.5 Integration**

In the case of BAC, it has been argued that a common cultural heritage and extensive regional self-governance in various policy areas related to economic development such as technology, innovation and industry, form the bases of the Basque Regional Innovation System (e.g. Cooke et al. 1997). It was further contended in chapter 3 that the technology parks are both believed to be a part of an innovation system and to perform system policies. On the basis of this it was argued in section 3.6 that one could expect extensive contact and collaboration between the organisations located on the parks and that the on-park organisations have contact with the local HEIs, universities and research centres. Lastly, it was expected that the on-park location ensures proximity to clients, as well as good opportunities for new ones.

While both of the two technology centres interviewed reported to have extensive relations with other on-park organisations, none of the private-for-profit companies did. Two of them reported to have business relations, while the telecommunication company also reported to have joint research projects with other on-park firms. However, all of the private-for-profit companies emphasised that employees in different on-park organisations sometimes knew each other, and that they would communicate and update each other on what they were working on. When asked about their general impression of collaboration between the on-park companies, all the interviewees responded that except for the contact between the technology centres and other tenants, they did not think there was a lot of formal collaboration going on. Notably, one of the interviewees argued that there would probably be differences between the buildings. Moreover, he suggested that the informal collaboration would probably be a bit higher in buildings where the same type of business outlook existed. However, he did not suggest in which of the buildings in the park this might be the case, nor whether this was just a guess or based on things he had heard. The interviews therefore appear to point in the direction of little on-park collaboration.

The survey gives no clear implications as to whether there exist a lot of cooperation on the park or what type of collaboration that does exist. However, it is notable that

nearly half of the 23 respondents reported to have no contact with other on-park organisations. This certainly backs up the general impression of little collaboration expressed by the interviewees in the section above. In the questionnaire the respondents who reported no collaboration with other on-park organisations were asked to give a reason why this was so. Although most of those that responded no collaboration chose not to give a reason, two of the respondents replied to this question. While one of the respondents replied that the organisations belonged to different sectors, the other expressed lack of common interests. It is also notable that the organisations reporting to have no collaboration with other tenants belong to different sectors.

Nevertheless, 12 respondents reported to engage in cooperation with other on-park organisations. Although all types of collaboration listed in the questionnaire could be found, the most common type was joint research projects and the sharing of facilities. It should however be noted that much of the on-park joint research reported probably is collaboration between technology centres and on-park companies, and not between private-for-profit firms. For instance, 8 of the 12 companies reporting to have joint research projects with other on-park organisations, also reported to collaborate with the technology centres located in the park. If this is the case, it backs up the general impression expressed in the interviews of little collaboration between on-park for-profit firms.

As for the expectation that the on-parks organisations are well embedded into the regional innovation system, the impression was that this was very much the case with the six organisations interviewed. All of them reported to have contact with the public university, government institutions and other companies in BAC. However, the two technology centres interviewed should be regarded as special cases as they were explicitly set up by the Basque Government to enhance the technology competence of the firms located in the Autonomous Community.

However, the results from the survey are somewhat more unclear than with the interviewees. 15 of the 23 the organisations responding, reported to have contact with HEIs in the Basque Autonomous Community, where as 9 of these reported to have

contact with the public university. All of the forms of contact between the on-park organisation and the HEIs that were listed existed. Though, it can be added that the most common form of contact was joint projects with HEIs and recruitment, with respectively 11 organisations reporting these types of contact. Notably, only 3 organisations reported to have informal contact with the HEIs. It should be noted that 8 organisations reported to have no contact with the HEIs in BAC. However, 6 of these nevertheless reported contact with other firms located in the region. Furthermore, less than half of the respondents, 9 of the 23 organisations surveyed, reported to collaborate with other public organisations in the Basque Autonomous Community.

As for the expectation about proximity to customers and the possibility for recruiting new, the organisations interviewed, expressed that this was not an important location factor. One of the interviewees expressed the following view; “The proximity is in the computer these days.” While another interviewee said that when having meetings with customers it was more practical if they too were located on the park, but apart from that the location did not really make a difference. The interviewee further claimed that those organisations that wish to cooperate find each other anyhow.

The same tendency was revealed in the survey, of the 23 the organisations participating in the survey, only 5 firms reported that they were pleased with the location in terms of proximity to clients, and 7 for the possibility of recruiting more.

In sum it can therefore be argued that, contrary to what was expected in chapter 3, the general impression of the interviewees was that there was little collaboration between the on-park private-for profit firms. This of course may be viewed in relation to a rather loose let-in policy, as was suggested by the evidence in section 6.2. Furthermore, while the interviews suggested that the on-park companies nevertheless were well embedded in the regional innovation system, the results from the survey were somewhat more unclear. However, again it is notable that proximity to clients, which is emphasised in much of the innovation theory in chapter 3, did not appear to be much enhanced by the location. Contrary to what was expected based on the national and regional innovation

approach, some of the evidence point in the direction of the on-parks firm not being well integrated into the Basque Regional System of Innovation. Again this prompts further question on the role of the technology park, and especially whether it is well embedded into the regional innovation system or function as an enclave.

## **6.6 Design**

In chapter 3.5 it was argued that one of the most important aspects of the innovation process that needs to be managed is the flow of information and knowledge. It was contended that much of the information flow take place in face-to-face meetings between people. On the basis of this it was argued that it was expected that the technology parks enhanced contact between staff both inside and between organisations, by having architecture and common facilities, such meeting-rooms and cafeterias that encouraged this. Further, it was expected that the parks would aim to facilitate information flow by acting as gatekeepers.

As discussed under 6.3, the Technology Park of the Basque Country offers meetings-rooms of various sizes with technical equipment, an auditorium, video- conference room and a social club. However, in this respect it can be noted that the services need to be booked and rented. Two of the interviewees pointed out that there were few places to socialize and take a drink in the park, and that it was would have been good if the social-club had been a place to take a drink, rather than a place for rent.

As for the eating areas, all the interviewees pointed out that they had had their own kitchen, and so they had their own eating-areas. It was further contended by one of the interviewees that there was a lack of cafeterias in the park. She elaborated this further by adding that there had not really been a sufficient up grading of number of cafeterias and restaurants after the park had doubled in size, and that this probably was the reason why most of the companies also preferred to use their own kitchens.

As for the architecture of the park it should be noted that the park covers a large area. It is constructed in such a way that many companies have their own buildings, this of course gives the companies the freedom to create their own eating areas and meeting rooms etc. Furthermore, because the buildings are scattered over a large area there is quite a walk between various parts of the park. This too can be a factor that discourages the staff and companies to meet and use common facilities.

At the time of the interviews, there were no common laboratories on the park. However, as mentioned before, one was in the planning stage as a part of the incubator for biotechnology companies. Furthermore, the park offered no sport-facilities.

As for the role as a gatekeeper, there was no library there at the time speaking to the innovation manager. She did however add that there was a wish from side of the management of the park to establish an on-line library. As for connection to knowledge institutions, the park has as already mentioned established contact with two centres of excellence in the biotechnology sector and good contact with the public university of the Basque Country.

In sum, it can therefore be argued that although common facilities do exist, there seem to be too few of them for the size of the park. Also it can be added that the scattering of buildings over a large area, does not encourage people to meet or the use of common facilities that already exist. It therefore appears that the design of the park does not really encourage the communication and frequent face-to-face meetings as was emphasised in the much the innovation theory. It is also dubious whether the park really acts as a gate-keeper as there is no on-park library and it is unclear what the contact with the knowledge centres actually entails. It therefore appears as though the park does not really function as innovation policy the way prescribed by the management approaches to innovation.

## 7 Conclusion and Perspectives

In this thesis I set out to explore Technology Parks as innovation policy. I did this by first looking at the potential role of these parks as innovation policy in two generic classes of economic theories, respectively the neoclassical and evolutionary. I concluded that indeed according to these economic theories the parks have potential as innovation policy, though they emphasise different areas. While the neoclassical theories mainly see the parks in relation to the alleged under-provision of R&D and how they may correct this, evolutionary theories take a broader view on the parks. More precisely, it was argued that according to an evolutionary rationale the parks should be seen in relation to the overall learning capabilities of firms and how they may enhance these capabilities. Moreover, it was contended that technology parks according to an evolutionary rationale can support the on-park organisations in 3 areas in relation to innovation; by influencing internal processes in the on-park firms, the on-parks firms' external knowledge sources, and the links between the on-park firms and their external sources of knowledge.

However, in order to specify and explore the role of technology parks as innovation policy further, I also identified four different approaches to innovation and related these to technology parks. The four perspectives discussed were respectively; entrepreneurial studies, sector approaches, regional and national system approaches and management approaches. Because these four approaches to a large degree are based on empirical research on innovation and are not really comprehensive theories, I also related them to neoclassical and evolutionary economic theories in order to shed some light on their theoretical foundation and rationale for innovation policy. I argued that although these approaches differ in their relative emphasise on various actors and aspects in the innovation process, they overlap in their view on innovation as a complex social process involving many actors combining the use of both internal and external knowledge. I argued that this, with the exception of parts of the management approaches, was due a common base in evolutionary economic theories. Hence, the parks according to the approaches lined out, may help the on-park organisations in their innovation process by developing the network of these companies. It was further emphasised that in

accordance with evolutionary economic theories, the competence base of the firms differs and so does the innovation process. Accordingly, a key point is that the parks need to differentiate their policies in order to adjust them to the on-park firms. On the basis of the four approaches, the following five propositions about the technology parks as innovation policy were then lined-out:

1. The parks take a strategic approach as to which sectors and types of companies they let-in.
2. The parks differentiate policies.
3. The parks take a systemic approach.
4. The on-park organisations are well embedded into the innovation system their respective parks form a part of.
5. The architecture of the parks encourages communication and integration in and between the on-park organisations.

Because evidence from previous research suggests that these parks often do not have the alleged positive effects, a case study was conducted. The main question in chapter six was therefore whether the Technology Park of the Basque Country functioned as innovation policy the way envisaged in the five propositions. It seems clear from the discussion in chapter six, that this was not really the case. Firstly, it was argued that evidence seems to point in the direction of a rather loose let-in policy, contrary to what was expected. The innovation manager of the park was vague on which criteria they used in the selection process and the company directory revealed that the on-park organisations belonged to a range of sectors. It was argued in chapter three that a loose let-in policy will not allow the on-park organisations to connect, and hamper the on-park knowledge exchange, because the firms are too different and do not speak the “same technological language”. Moreover, it was therefore suggested that other consideration than innovation policies might influence the let-in policy of the technology park. It was implied that earnings and stability were considered more important than taking a strategic approach as to which sectors and companies allowed on the park in the case of the Technology Park of the Basque Country. These implications were linked to the fact that park had quickly raised the number of tenants a

few years earlier, and was for the first time in 2001 making money. In this respect it was therefore argued that the park does not really function as innovation policy.

Secondly, the park does not appear to have an active and differentiated policy towards different sectors and types of firms. In chapter three it was argued that because the firms have different competence basis and accordingly innovate differently, there will also be a need to adjust the innovation policy to the particular on-park organisations in order to ensure the wanted effect. The evidence however appears to point in the direction of the technology park taking on a more passive care-taker role. Most notable was the fact that they had not yet a policy directed towards the NTBFs and the biotechnology sector, which according to the theory needs special help to develop market and management skills, good business plans and access to academic staff in the innovation process. Again, the park did not really function as innovation policy the way expected.

Thirdly, although the management of the park appears to have good contact with various important actors in the regional innovation system, access to regional resources does not appear to be an important location factor for the on-park organisations surveyed. Rather, the most important location factor for these organisations surveyed appeared to be image. Again this is somewhat surprising as it was suggested on the basis of the theoretical discussion, that the firms are embedded in an innovation system and are dependent on access to external knowledge in order to innovate. Arguably, ensuring access to these external resources should be an important function of the parks if they are to function as innovation policy. It may of course be contended that image might be helpful, especially for NTBFs in the innovation process, as it may give the firms credibility and so in this way indirectly help access to capital and knowledge. However, it may be pointed out that image is hardly the most important resource in the innovation process and hence the technology parks in this sense will only have a marginal influence as innovation policy, and certainly do not function as innovation policy as prescribed by national and regional system approaches to innovation.

Fourth, evidence revealed that although the six on-park organisations interviewed appeared to be well embedded in the regional innovation system, the firms had little



contact with other for-profit on-park firms. It was suggested that this might to a large degree be due to a loose let-in policy. However, evidence from the survey appeared more inconclusive. Half of those responding reported no contact with other on-park organisations, while the other half did. It also appeared far from clear whether on-park organisations were well integrated into the regional innovation system as expected in the theory in part 3. In fact some evidence rather seemed to point in the direction of the parks being enclaves with few ties to the near surrounding, which is in accordance with much of the findings from research done on these parks (e.g. Massey et al. 1992). For instance, only 8 of the 23 surveyed firms had contact with the public university and 14 reported no collaboration with other public organisations in BAC. On the other hand, more than half reported contact with other HEIs in BAC and of those not reporting contact, most of them had nevertheless contact with other for-profit firms in the region. However, it was notable that locating in the technology park did not enhance closeness to customers, which according to much of the literature is important in the innovation process. This certainly also point in the direction of the park being an enclave, rather than being fully integrated in the innovation system.

Lastly, there appears to be little evidence of the park enhancing the information flow through common facilities, nor that they act as gate-keepers as emphasised in the management approaches to innovation. In sum it can therefore be argued that the empirical findings suggest that Technology Park of the Basque does not really function as innovation and policy the way envisaged in chapter 3.

In a way the empirical findings from the case appear as a paradox, considering that a major conclusion from the theoretical discussion is that the technology parks have good potential as innovation policy and may influence the innovation process of the on-park organisations in a number of ways. An important question that follows is; why did the empirical findings not support the propositions? The particular case investigated might be part of the explanation. As discussed in the presentation of the case, the park forms a part of the regeneration strategy towards a more diversified industry. It was important in this respect to attract large companies from abroad as well as from other regions of Spain. In this sense the park might serve an important function as location for such

companies, rather than as innovation policy *pr se*. Ibarondo, the innovation manager of the park, underlined this when she insisted that the single most important effect of the park was the attraction of large foreign companies. In this sense, another park might have been better as a case for investigating technology parks as innovation policy. However, the results are also influenced by the methodology chosen. A larger survey of more parks, from both Spain and elsewhere for instance, might have revealed a different result. Though, as mentioned in the introduction, the tentative results from the study done here do not really deviate that much from what has been found in other investigations of technology parks. Even if these studies do not explicitly inquire into technology parks as innovation policy, the most compelling conclusion from these studies is that image is the single most important location factor and added value in view of the on-park tenants (e.g. Ferguson 1999, Lovgren 2003 and Monch et al. 1988). This is an intriguing finding, as it suggests that the parks might better be understood in relation to other theories than those used in this thesis, e.g. theories on image and marketing.

Further research on the Technology Park of the Basque Country is recommended. As commented, a more representative sample for the survey and the interviews would probably have revealed more about how the park functions as innovation policy. Moreover, further research would also tell us something about how the park has developed since 2001. Have they introduced a more differentiated policy as was planned? If yes, what is the effect on the on-park organisations? If no, why did they choose not to? Comparative studies of technology parks would most certainly also give further insight to technology parks as innovation policy. However, because there is already much empirical research done on these parks, this might be a good reason to systemise and compare these studies, both in order to further explore the role of technology parks as innovation policy and to better understand the benefits or lack of benefits of these parks, e.g. in relation to the image.

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## Appendix

### Interview-guide:

Very briefly, can you please lay out the history of your organisation or company?

What year was the company set up?

What year was it located in the technology park?

Number of employees now and in the start?

What is the main activity of your organisation or company?

Where are most of your customers based?

What were the most important factors behind your decision to locate in the technology park?

First asked to freely mention which they considered to be the important, then asked to comment on whether they considered the following location factors as important, somewhat, little or not important;

- Possibilities for collaboration or access to the UPV- the public university
- Benefit from an innovative environment in the park
- Good transport possibilities and close to the airport
- Possibilities for public support
- Image
- Costs

How do you consider the management of the park?

How pleased are you with the following location aspects?

- Proximity to clients
- New clients
- Recruitment
- Cooperation with HEIs and public institutions
- Costs
- Image

Do you have contact with the other companies or organisations in the park? What type of contact?

Do you have contact with other public institutions in Basque Autonomous Community?

What is your general impression of contact between the organisations and companies in the park? What sort of collaboration takes place?  
Have you considered moving out of the park? If yes, why?

Interviews were carried out with seven very different types of organisations; two business consulting companies, two public\ private technology institutes, one telecom company and ice company.

**Interview-guide with a representative from the management of the technology park, the innovation manager; Mrs Angeles Ibarrondo**

What was the main mission of the park when put up?  
What is the organisation status of the park?  
How is the park management organised?  
How is it financed?  
What is the land policy, what companies do you try to attract, are there any type of companies which are prohibited?  
What is the profile of the tenants?  
What types of services and support do you offer?  
Do you have an incubator?  
How do you promote the park?  
What do you believe are the most important locations factors for the on park organisations and companies?  
What do you believe are the main advantages compared to the two other technology parks in the Basque Autonomous Community?  
What is your relation to the Public University?  
What indicators to you use to evaluate the park?  
What are the main challenges of the parks\ room for improvements?  
What do you consider the most important impact of the park to be?

**Questionnaire:**

**Here follows the questionnaire,  
Indicate with a “v” for the statements that are correct**

**1. General information about your company:**

**- Organisational status:**

Is your company a:

- Single firm    / /

- Multiplant firm                      In this case is it a:    • headquarter                      / /



- Subsidiary / branch plant / /

**- If your company is a subsidiary or a branch plant, where is your headquarter located?**

- Elsewhere in the Basque Autonomous Community / /
- Elsewhere in Spain / /
- Abroad / /

**- What year did your company locate in the technology park?**

- Year:

**- Did your company exist before it was located in the technology park?**

- Yes / /
- No / /

**- If yes on previous question, indicate the previous location of your organization**

- Bilbao / /
- Elsewhere in Basque Autonomous Community / /
- Elsewhere in Spain / /
- Abroad / /

**- What is your organization's main activity?**

- Pure research / /
- Research and development of high tech product and processes / /
- Software design / /
- Manufacturing / /
- Sales / /
- Training / /
- Other / /

**- Has your company introduced new product innovations in the past three years?**

- No      / /

- Yes      / /      If yes, were they new to the market?

-No      / /

- Yes      / /

**- Have your company introduced any other forms of innovation?**

- No      / /

- Yes      / /      If yes, were they new to the market?

- No      / /

- Yes      / /

**- How does your company usually become aware of a new innovation?**

- Journals      / /

- Conferences      / /

- Customers firms      / /

- Consulting      / /

- Industry      / /

- Technology transfer agencies      / /

- Internet      / /

## **2. Location factors and collaboration:**

**- Can you indicate whether you consider the following factors as:** Very important 4, somewhat important 3, less important 2 or not important 1, reasons for your organization choice to locate in the technology park:

- Scope for collaboration and access to the facilities of the Basque University      / /

- Possibility to “tap in” on the parks innovate environment      / /

- Basque Autonomous Community (BAC) has a good business climate      / /

- Good transport and communication links in BAC      / /

- The possibility to receive some public support from BAC      / /

- BAC has good cultural and social amenities      / /

- Key founder lived locally or the organization was already located in BAC      / /

- Locating in the park gives the organization a favourable image      / /

- Cost premises      / /

- Others      / /

**- How do you perceive the management functions in the technology park:**

- Passive or not required    / /
- Helpful                                / /
- Very helpful                                / /

**-How does the park satisfy your business in the following areas?**

Rate them from 1-4, one being the lowest and 4 the highest

- Proximity to main clients                                / /
- Possibility for new clients                                / /
- Recruiting new employees                                / /
- Cooperation with university or other higher education    / /
- Costs    / /
- Image    / /

**- Does your organization collaborate with other organization in the park?**

- Yes / /
- No / /

**- If yes to previous question, what kind of collaboration?**

- Formal joint research projects                                / /
- Formal exchange of staff                                        / /
- Sharing of facilities and/or services provided by the park    / /
- Informal collaboration    / /
- Others    / /

**- Which of the above of the aforementioned collaboration forms do you consider as most important?**

**- Are the organizations you collaborate with mainly from the same sector as your company?**

- Yes / /
- No / /

**-Does collaboration involve the technology centres in the park?**

- Yes / /
- No / /

**- If there is no collaboration between your organization and other organization, what are the main reasons for this?**

**- Does your organization have any contact with any of the institutions of higher education in the Basque Autonomous Community?**

- The Basque University        / /
- The Private University       / /
- The School of engineering    / /

**- If yes to previous question, what type of collaboration?**

- Joint projects        / /
- Recruitment        / /
- Informal contacts / /

**- Do you collaborate with other out-door organization in BAC, if yes, what type of organizations?**

- Private enterprises from same sector        / /
- Private enterprises from other sectors       / /
- Public organizations        / /
- Technology centres        / /

**- Do you consider alternative or additional location, if yes, reason for this?**

- More space required        / /
- Marked        / /
- Technical        / /
- Costs        / /
- Other factors        / /

**- If the Technology Park didn't exist, where do you think your organization would be located?**

- In some of the other Technology parks in BAC    / /
- In BAC        / /
- Some where else in Spain        / /
- Abroad        / /
- The organization would not exist at all        / /
- Others        / /

